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FUTURE OF THE DOMESTIC OIL AND GAS INDUSTRY

HEARING

BEFORE THE

SUBCOMMITTEE ON MINERAL RESOURCES DEVELOPMENT AND PRODUCTION

OF THE

COMMITTEE ON ENERGY AND NATURAL RESOURCES UNITED STATES SENATE

ONE HUNDRED FIRST CONGRESS

SECOND SESSION

ON THE

FUTURE OF THE DOMESTIC OIL AND GAS INDUSTRY

ROSEWELL, NM, APRIL 11, 1990

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CONTENTS

STATEMENTS

	Page
Bayless, Robert L., Independent Petroleum Association of New Mexico	65
Bell, L.N., vice president, Engineering and Operations Coordination, ARCO Oil & Gas Co	66
Bingaman, Hon. Jeff, U.S. Senator from New Mexico	1
Calisch, Robert, director, Gas Supply and Statistics, American Gas Association	92
Cates, Bob, director, Oil Field Training Center, Eastern New Mexico University	106
Chaney, Michael, vice president/operations manager, Ziadril, Inc., on behalf of the International Association of Drilling Contractors	134
Domenici, Hon. Pete V., U.S. Senator from New Mexico	2
Lehman, Charles, economic analyst, Economic Research Bureau, New Mexico Department of Labor	27
LeMay, William, director, Department of Energy, Minerals and Natural Resources, Oil Conservation Division, State of New Mexico	22
McElwrath, Michael R., Principal Deputy Assistant Secretary for Fossil Energy, Department of Energy	4
Ortiz, Isaias, general manager, Coal Bed and Methane Operations, Consolidated Natural Gas Co., on behalf of the American Gas Association	94
Picinni, Raymond A., senior economist, American Petroleum Institute	110
Van De Graaff, Darwin, executive vice president, New Mexico Oil & Gas Association	77
Walker, Donald, regional drilling manager, Meridian Oil Co	73

FUTURE OF THE DOMESTIC OIL AND GAS INDUSTRY

WEDNESDAY, APRIL 11, 1990

U.S. SENATE, SUBCOMMITTEE ON MINERAL RESOURCES DEVELOPMENT AND PRODUCTION, COMMITTEE ON ENERGY AND NATURAL RESOURCES,

Roswell, NM.

The subcommittee met, pursuant to notice, at 9 a.m. in the Performing Arts Center, Eastern New Mexico University, Roswell Campus, Hon. Jeff Bingaman, presiding.,

OPENING STATEMENT OF HON. JEFF BINGAMAN, U.S. SENATOR FROM NEW MEXICO

Senator BINGAMAN. Good morning. This is a field hearing of the Subcommittee on Mineral Resources Development and Production of the Senate Committee on Energy and Natural Resources.

I want to first thank Lloyd Hughes, who is the provost at Eastern New Mexico University, for the hospitality in letting us use these facilities and the help in setting this up; Bob Cates, the director of the Oil Field Training Center; Larry Harris, who is the president of the Oil Field Training Center Foundation; the IPA New Mexico and the New Mexico Oil & Gas Association, all of these organizations have been very helpful to us in organizing this hearing and the activities that surround the hearing, so we appreciate that.

The topic for the hearing is the future of the domestic oil and gas industry. More precisely, we'll explore our ability to actually produce and deliver the country's oil and natural gas resource base. This involves the technology to discover and produce oil and gas efficiently and economically, the ability to process and refine the resource, and the products that can be used to fuel our economy and the means to transport the product from producing regions to consuming markets.

It's obviously more than just the drilling rigs and pipelines and refineries. It's also the human resources, the geologists and petroleum engineers and trained crews, to work oil rigs, processing plants and refineries.

The hearing today is timely for several reasons. First, U.S. oil production is declining at an alarming rate. In January the American Petroleum Institute reported that last year U.S. oil production declined by over half a million barrels per day, nearly 7 percent. At the same time, the slack caused by declining domestic deliverability has been taken up by increased imports of foreign oil and petroleum products.

Growing domestic demand along with declining U.S. production has raised our imports by three and a half million barrels per day. Increased U.S. imports have accounted for more than half of the growth of OPEC's exports.

In some recent months our import dependency has exceeded 50 percent, and the prospects for the future scarcely gives us reason to think that that trend will change. In 1995, U.S. imports should reach 10 to 11 million barrels a day. The cost of oil imports will have more than tripled from its low point. Indeed, the oil import bill then will likely exceed our present trade deficit. While our dependency continues to grow, the pace can be affected by our policy decisions.

The second reason that the hearing is timely is that conventional oil recovery technologies leave a lot of our oil in the ground. The United States has produced more oil than any other nation in history. Unless new technologies for oil recovery are rapidly developed and deployed, the U.S. will leave behind twice as much in known reserves as it has ever produced from them.

Third, while the future looks bright for natural gas and the resource base appears ample, some have expressed concern about whether deliverability is sufficient to keep pace with growing demand.

Fourth, the infrastructure that previously sustained domestic exploration and production has been sharply reduced in the past half decade.

And, finally, this last week the U.S. Department of Energy released an interim report on the national energy strategy process. What we learn at today's hearing should help those of us in Congress to make a contribution when we comment on DOE's interim report. Copies of that report are available on the tables as you come in or at the rear of the auditorium.

We have three panels of highly qualified witnesses today, some of whom have traveled from outside the state to be with us, and we look forward to their testimony. I'm also very pleased that Senator Domenici, who is a colleague on the Senate Energy Committee, is here to participate. Congressman Skeen, Congressman Richardson and Congressman Schiff were all invited to attend but were unable to do so.

Before we proceed with witnesses' testimony, let me defer to Senator Domenici for any comments that he would like to make.

STATEMENT OF HON. PETE V. DOMENICI, U.S. SENATOR FROM NEW MEXICO

Senator DOMENICI. Thank you very much, Mr. Chairman, and thanks to all of you for being here.

Let me first quickly give you what I choose to call a very simple proposition, but I will call it Domenici's first law of human progress. Nothing is more important to our future, to that of our children and generations to come, than secure and dependable supplies of clean energy at reasonable prices.

When we had the oil crisis, I was a very junior senator and I recall, Jeff, that one witness got up and said—I guess it was the third day of the Jackson hearings—"Shame on America. We use

one-third of the world's energy supplies and we're only about 6.8 percent of the world's population."

That proposition was left dangling until a week later, a witness testified and said, "I heard the statement. But isn't it interesting," said the witness, "the United States of America produces one-third of the world's goods and services." One-third of the energy; one-third of the world's goods and services.

That is not to say that we have not wasted energy in the past, but that ought to tell anyone that the economic future of America is tied to energy supply. That's what we're here talking about, I believe.

The second point I would like to make is that Americans run around in large numbers beating their chests about our growing dependence upon television sets from Japan and automobiles from Japan and whatever else it is that creates a trade deficit. No one runs around talking about the fact that we buy more foreign oil in dollars that we earn and send to some foreign country than all of the trade deficit with Japan. Our trade deficit for oil and related products is $50 billion and growing.

If we're worried about the trade deficit, why are we not worried about the oil and related products deficit? I think it's because we just don't understand that we are hostage. Our future and our growth is hostage to others so long as we send no signals, indicate no policies regarding our position as a nation as to our future energy supplies.

We do have a Secretary of Energy, as the Chairman indicated, who has taken on a very big job. He says he will produce an energy policy for this President. In fact, he will say privately he hopes to make this President an energy president, even if he currently isn't interested in being one. I hope he does.

I might say to the Department the report is neat. But if you don't put down the policies that move toward energy supply, then I think it will make good reading material.

Let me just give you my last notion. This country desperately needs a long-term, stable energy policy, and if it needs to be built around some incentives to produce oil and gas, so be it. Some think that's the end of the world. I believe they could be cost-effective and, if they are not, we ought not adopt them.

We all know of some that are totally cost-effective. Clearly, enhanced oil recovery credits ought to be adopted. If not, we're going to not only not recover the oil, much of it will be lost forever. I believe that's absolute lunacy.

Mr. Chairman, I'm advised that today FERC is going to enter Order 519. Isn't it marvelous for consistency that they are going to take away by regulation the 52-cent credit on tight sands prospectively? Sure lends itself to a lot of stability in the oil patch.

So I know that no one seems to have been able to predict with any certainty what's going to happen to energy in the world. In fact, the statements in the past 15 years are so radical that they shouldn't even be spoken. President Carter thought oil would be $40 a barrel by today. Secretary Schlesinger, when he was Energy Secretary, said they would be $38. Sheik Yamani said they would be in 20 years five times higher than they were when he was early

in his career. So we all predict with great reluctance and with great risk.

But seriously, the United States needs to decide what we want to do. Do we want to remain dependent?

And I will close by repeating what our Chairman said. The current trade deficit between the United States and the world is about $150 billion for everything?

Senator BINGAMAN. A little less.

Senator DOMENICI. A little less, $140-something. If you take out all the mercantile deficit, if you could just wish it away, we will be back at $100 to $125 within ten years, and it will all be oil. I think that's a rather startling proposition for a nation that is dependent upon energy for her future.

I have no quick answers, but I think there are some things we must do and clearly we need to know what it is we are trying to do. We will learn some of these things today, hopefully, in these hearings.

Thank you very much. Mr. Chairman.

Senator BINGAMAN. Thank you very much. Let me introduce our first panel here. The first witness is Michael McElwrath, who is principal deputy assistant secretary for fossil energy at the Department of Energy. His responsibilities include management of coal, oil and unconventional gas research and development programs, as well as the naval petroleum and oil shale reserves, and the strategic petroleum reserves and overseeing the national clean coal technology program. He also served as energy advisor to former secretary of interior Don Hodell.

Before joining the Reagan Administration in January of 1988, Mr. McElwrath spent ten years as an oil and gas attorney in Midland, Texas, during one of the most volatile periods in our nation's energy industry. He worked with all aspects of the energy industry, including major corporations, wildcatters, service organizations and consumer groups.

Our second witness is Bill LeMay, who is well known to all of us as the director of the oil conservation division of the New Mexico Department of Energy, Minerals and Natural Resources. He is a good friend to the oil and gas industry throughout our state.

Our third witness is Charles Lehman, who is the director of the planning, data and occupational information section of the research and analysis bureau of the New Mexico Department of Labor. He is responsible for preparation of reports on the current and future labor economy of our states.

Let us hear from each of these witnesses and then we'll have questions for all of you. Mr. McElwrath, why don't you go right ahead first.

STATEMENT OF MICHAEL R. McELWRATH, PRINCIPAL DEPUTY ASSISTANT SECRETARY FOR FOSSIL ENERGY, DEPARTMENT OF ENERGY

Mr. MCELWRATH. Senators, I appreciate very much the opportunity to be here today. It's a little bit like coming back home, and I certainly appreciate the opportunity to present the views of the Department of Energy on the status of the exploration and producing

sector, as well as the infrastructure of the domestic oil and gas industry.

I believe you've been supplied with copies of my written statement and, if possible, I'd like to submit that for the record, and for purposes of today's hearing, to briefly summarize that statement.

The bottom line is that after more than a century of the most extensive exploration and production in the world conducted by this country, our domestic oil and gas resource is now essentially mature. Certainly that's true onshore in the lower 48. Oil production, therefore, is naturally declining and increasing numbers of domestic wells are now stripper wells, that is, they are producing less than ten barrels of oil per day.

The sharp increase in prices that we saw between 1973 and 1974 and 1979 and 1981 resulted in substantial increases in exploration and intensive field development in this country. But with the return of low prices after 1986, oil industry activity has dropped dramatically. The number of wells drilled has dropped by 63 percent, from a peak of 80,816 wells drilled in 1981 to only 29,741 wells drilled in 1988. Completions declined during that period by 61 percent. And, importantly, enhanced oil recovery projects for our mature resource dropped 84 percent, from a peak of 74 projects in 1983 to only 12 EOR projects in 1987.

As a result, we saw hundreds of oil companies essentially go bankrupt, especially the smaller companies that are so active in this area of the country. We saw a lot of low-volume-producing wells that were plugged or abandoned.

We also saw, as a result of that, severe decreases and negative impacts upon the infrastructure in this country. I'll cite one statistic that I think is absolutely devastating. Only 42 Ph.D. graduates were reported in petroleum engineering in the year 1988 to 1989, 42 in the entire country; 69 percent of that total were foreign nationals. Clearly, that trend, which exists throughout the infrastructure of the industry, presents a very serious, if not deadly, threat to the oil and gas industry.

With that background, let me turn to what we at the department foresee for the domestic oil industry of the 1990's. And I would also like, along those lines, to discuss some of our thoughts with regard to research and the deployment of technology. Because through the deployment of that technology and through research, we can recover, we hope, more of our known oil reserves and may be able to slow what has been a very drastic decline in domestic production.

In DOE's projections, U.S. petroleum demand is expected to grow by a little less than one percent a year in the first half of the 1990's, or by about a million barrels per day between now and 1995. The second half of the 1990's is expected to show a little bit slower demand growth with an average price of $25 a barrel in 1989 dollars. But this growth will still add another 600,000 barrels per day to U.S. consumption.

Unfortunately, and dramatically, we're going to see at the same time an almost equivalent decline in U.S. domestic production. So while demand is going up, by an equivalent amount production will be going down domestically. What does that mean? It means exactly what each of the senators have stated this morning, that we're going to see an even higher level of oil imports into this country.

In our projections, which I'm beginning to take issue with, we project imports to increase to over 50 percent of consumption by 1995 and 55 percent of consumption by the year 2000. At that point, we would be importing 10.5 million barrels of oil per day.

But, as has been noted, the fact is that for the past several months we've already been flirting with that 50 percent level, and that's probably an indication that even our disheartening projections at DOE are too conservative, that imports could increase to 50 percent of consumption much sooner than we thought, and may even hit 60 percent by the year 2000.

The rate of decline of domestic production can be slowed by the discovery of new fields, primarily offshore and in Alaska, by an increase in conventional developmental drilling in existing fields, or by the increased use of enhanced oil recovery and other advanced technologies, such as horizontal drilling, that should recover more of the oil and gas that's already been found but currently is left behind by conventional production methods.

Despite all of those possibilities, we'll never be able to reduce the trend for increased imports in this country. But we have to do our best to minimize that.

Let me turn for just a minute to the National Energy Strategy. We've just issued an interim report, and essentially all that that is at this point in time is a compendium of the public testimony that we have received in over 15 hearings across the country with approximately 385 witnesses. At this point that report, as Senator Domenici pointed out, does not contain any conclusions or recommendations. But these will be developed for the final report in December.

The options that have been put forth by the public identify certain government actions that could be taken in the oil and gas sector. They involve both production and consumption. On the production side, options range from tax incentives to innovative leasing plans, increased research for advanced production techniques and regulatory changes. We are evaluating those options now and we will generate conclusions later in the year.

Having said that, let me move to something that we are doing now. We're not waiting on the NES to do this. We are aggressively pursuing government-sponsored research. We're doing that because over 500 billion barrels of oil in place have been discovered in oil and gas reservoirs, but only a third of that, 145 billion barrels, has been produced through 1987.

With current production techniques, we've got about 27 billion barrels, or only nine years of supply at current production rates, remaining to be produced. That leaves about 341 billion barrels, or nearly two-thirds of the oil that we've already discovered, that would remain in known reservoirs using conventional production techniques.

The fact is, though, that we estimate about 76 billion barrels of that reserve to be producible using other technologies. That's the research we are engaged in at the Department of Energy, learning how to produce more of the oil that has already been found.

At a public meeting that we had in Washington on January 31 of this year, Deputy Secretary Henson Moore announced what we believe to be a very fundamental restructuring and refocusing of our

oil and gas research efforts. We are moving concertedly from a focus on long-term research, basic research, high-risk research, to a distinct emphasis on near- and mid-term applied research, research that can get out into the field into the near future.

The goal of that is to have more effective and widespread use of existing technology, because the marginal fields and marginal wells in this country are being abandoned at an alarming rate and we have to be sure that the current technology is utilized to forestall that abandonment. Otherwise, there won't be any wells left to which to apply the advanced technology.

Let me add this, that the long-term research aspects of our program are not being abandoned. But instead of constituting about 75 percent of our budget, they're now down to about 25 percent. We intend to pursue those so that if we keep the marginal fields and wells open, we will have advanced technologies to apply there in the future.

A study that we released at the January meeting, based on data that was compiled from more than 700 reservoirs in nine major oil producing states, concluded that nearly 60 percent, 60 percent, of the known crude oil remaining in the lower 48 could be abandoned or exist in inactive fields by the year 2000. That's even if oil prices return to the $30-a-barrel range. At current prices, we estimate that that abandonment rate is likely to be near 70 percent, 70 percent of our existing wells in existing potential reserves closed off to future production.

These are, in my way of thinking, disastrous numbers, not just for the industry, but also for our nation as a whole. That explains why we're shifting our research emphasis.

We've got two objectives in the near term in research within the Department. To develop, importantly with industry, a much more thorough data base that tells us about the fundamental characteristics of major reservoir types in this country. Utilizing the information that we gain from that reservoir characterization, we want to identify with industry two things; the reservoirs that have a lot of oil remaining in place and, then, looking at that group of reservoirs with lots of oil in place, we want to identify those among that group that are in severe near-term risk of abandonment.

Having done that, we will begin to work aggressively with industry to apply existing technology to effectively recover the oil in those high-risk reservoirs and to keep them open for potential advanced technologies in the future.

In the near term, we estimate an additional 15 million barrels of oil could be recoverable with the use of existing technologies like improved waterflood and infill drilling technologies. We want to serve as a clearinghouse for the development, implementation and technology transfer of that technology. When we know how one of our technologies works in an existing field, in a certain type of field, we will try to get that information out to the private sector, out to other producers in similar fields.

I might mention that the oil recovery technology partnership, which DOE initiated here in New Mexico with Sandia and Los Alamos national labs, is already helping to augment our technology transfer efforts, both to independents and to major producing companies.

So far I've been talking about oil. What about gas? Well, it is our view that the barriers to increased production and use of natural gas are essentially regulatory in nature. They don't have much to do with the existing resource base. We're working on identifying the barriers and analyzing options for regulatory reform. That will be a major portion of the National Energy Strategy effort.

Nevertheless, we're already commencing upon a coordinated research program with industry. And the emphasis there, again, is going to be shifted to more near-term applied research. In that regard, we're concentrating on developing a comprehensive data base comparable to what is already being developed and is somewhat down the line with regard to our oil resource.

We will continue the secondary gas recovery project that we are conducting in concert with the Gas Research Institute and the Bureau of Economic Geology out of the University of Texas. We are undertaking there to look closely at bypassed accumulations of oil and already produced gas fields. We believe that there is a substantial amount of gas remaining to be produced in isolated pockets within existing fields, much more than we thought a few years ago.

In the midterm, we'll go back to unconventional gas in a bigger way, field testing for advanced techniques for recovery from shales, tight sandstones and geopressured aquifers. In the long term, we'll move to even more speculative research like deep basin gas and gas hydrates.

That summarizes, I think, what we're doing in the NES very briefly. It also summarizes our refocused oil and gas research efforts. We do believe that, perhaps for the first time in a long while, our program is being shaped by what are really harsh realities in the real world and in the industry, and we are seeking aggressively to shift direction and funding towards immediate practical results instead of esoteric long-term research.

We have to do that, very importantly, in concert with industry, with a number of the people that are here in the audience today, and we intend to do that.

Thank you. That concludes my prepared statement and I'm prepared to answer any questions.

[The prepared statement of Mr. McElwrath follows:]

STATEMENT OF MICHAEL R. MCELWRATH
PRINCIPAL DEPUTY ASSISTANT SECRETARY FOR FOSSIL ENERGY
U.S. DEPARTMENT OF ENERGY
to the
Subcommittee on Mineral Resources Development and Production
of the
Senate Committee on Energy and Natural Resources

April 11, 1990

Mr. Chairman and members of the Committee, I appreciate this opportunity to present the Department of Energy's views of the status of the exploration and producing sector and infrastructure of the domestic oil and gas industry.

After more than a century of the most extensive exploration and production in the world, the domestic oil and gas resource is mature. Oil production naturally declines and increasing numbers of domestic wells are now "stripper" wells -- that is, they produce less than 10 barrels per day. In fact, nationally, these wells are averaging less than 3 barrels of oil per well, per day.

Domestic lower-48 crude oil production peaked in 1970 at 9.2 million barrels per day and has declined since then by more than 17%. The giant Prudhoe Bay discovery in Alaska -- a find of rare proportions --- tempered the overall U.S. production decline. Prudhoe Bay, too, has shown the first signs of production decline in 1989 leading to an Alaskan production decline of 7% last year. Discovery of another giant field is considered speculative even in the remaining unexplored areas.

The sharp increase in oil prices between 1973-1974 and 1979-1981 resulted in a substantial increase in exploration and intensive field development. With the return of low oil prices after 1986, the oil industry activity has changed dramatically. Exploration and development efforts decreased substantially. The number of wells drilled dropped by 63% from a peak 80,816 wells drilled in 1981 to 29,741 in 1988. In the same period of time, well completions declined by 61%. Enhanced Oil Recovery (EOR) project starts dropped 84% from a peak of 74 in 1983 to only 12 in 1987. Hundreds of smaller oil companies went bankrupt, and many high cost, low volume producing wells were plugged or abandoned. The decline in petroleum exploration and development activity drove many skilled oil industry personnel out of the oil business.

With reduced employment prospects came a sharp decline in student enrollment in petroleum engineering and geology. Only 42 PhD graduates were reported in petroleum engineering in the year 1988-89, of which 69% were foreign nationals. This trend alone threatens the future of the U.S. petroleum industry.

As these trends continue, most large, U.S.-based companies are spending a higher proportion of their exploration dollars overseas, where they find better opportunities for discoveries of oil and gas. U.S. petroleum equipment manufacturers and service companies follow the business to the extent that export of the equipment and technology is not controlled by the U.S. Twenty years ago, the U.S. oil industry completely dominated the world. Equipment, such as tubular goods, was manufactured overseas to U.S.

specifications. Today, several foreign petroleum companies are at the leading edge of the technology, and are beginning to dominate that market.

I would like to outline what we at the Department foresee for the domestic oil industry of the 1990's, and I would also like to discuss some of our thoughts for research. Through research to recover more of our known domestic, oil and gas resources, we may be able to slow the decline in U.S. oil production and enhance our natural gas production.

U.S. Outlook

In DOE's projections, U.S. petroleum demand is expected to grow by a little less than 1% per year in the first half of the 1990's, or by an additional 1 million barrels per day between now and 1995. This is based on the assumption of 2-3 percent GNP growth and an average price of approximately $18/barrel in 1989 dollars. The second half of the 1990's is expected to show slightly slower demand growth, assuming again a 2-3 percent GNP growth and an average price of $25/barrel in 1989 dollars. This growth is projected to add another 600,000 barrels per day to U.S. consumption by the year 2000.

An almost equivalent decline in U.S. domestic production is projected to accompany this growth in consumption. This decline will have the effect of roughly doubling the growth in demand for imports. On a net basis, the United States imported approximately 7.1 million barrels per day of crude oil and petroleum products in 1989, or 41% of consumption. Imports are projected to

increase to over 50% of consumption by 1995 and to 55% of consumption by the year 2000. At that point we will be importing some 10.5 million barrels of oil per day. The fact that for the past several months we have been hovering just below and in some instances above the 50% level for imports, may be an indication that even this dishearting estimate was too conservative and that our imports could increase to over 50% of consumption much sooner, and to perhaps in excess of 60% by the year 2000.

The forecast decline in domestic production of 1 million barrels per day by 1995 will mainly be due to the maturity of most discovered fields and the fall off in drilling activity. This rate of decline can be slowed by the discovery of new fields, by an increase in conventional developmental drilling in existing fields, or by the increased use of enhanced oil recovery (EOR) and other advanced technologies such as horizontal drilling to recover more of the oil and gas that has already been found, but is left behind by conventional production.

Geologists believe that there is very little likelihood of finding large new fields onshore in the lower 48 states. However, substantial reserves are thought to exist in the Outer Continental Shelf (OCS) and in Alaska. Through concerted efforts to find and produce more of our domestic resource we may be able to slow the rate of decline in U.S. production. But it is unlikely that we will be able to reverse the trend. Declining U.S. production is part of the overall oil market picture of the 1990's.

Refining Sector

The domestic refining industry, which processes both imported and domestic crude oil, is an integral part of the supply network. Refineries are impacted by the distribution and quality of available crude oil and the requirements for refined products. Air quality controls, refinery obsolescence, increasing demand, increased availability of imported products, and the economic environment have adversely affected this part of the industry over the past decade. The industry statistics for that period show a decrease in small refineries (less than 50,000 barrels per day) from 224 in 1980 to 105 in 1989; a reduction in the number of refining companies from 188 to 106; a decrease of 2.3 million barrels per day in refining capacity for the same period; and an increase in utilization rate to a 1989 high of 84.4%. Imports of high value refined products, particularly gasoline and heating oil, are projected to increase in the future when seasonal demands for those products cannot be met by the domestic refining, distribution and inventory system.

National Energy Strategy

The National Energy Strategy (NES) Interim Report that has just been released is a compendium of public testimony and written submissions received by DOE during an extensive public hearing process. It does not contain conclusions or recommendations. These will be developed for the final report in December.

The options identify for government actions in the oil and gas sector predictably cover a wide range of topics. They involve both production and consumption. On the production side, options range from tax incentives, to innovative leasing plans, increased research for advanced production techniques, and regulatory changes. DOE is now evaluating these options, again with a heavy reliance on public participation and coordination with other government agencies.

I would like to discuss the role of government-sponsored research in some additional detail. This is one of DOE's, and my office's, major responsibilities, and one that we think requires quick action. For this reason, we are not waiting for the entire NES process to be completed before embarking on a new set of initiatives.

Over 500 billion barrels of oil-in-place have been discovered in U.S. reservoirs. Just under one third, 145 billion barrels, has been produced through 1987. And 27 billion barrels, or about 9 years of supply at current production rates remain as proved reserves that can be produced with present technology at current oil prices. The remainder -- 341 billion barrels, or nearly two thirds of the nation's discovered oil -- will remain in known reservoirs at the conclusion of conventional production.

This massive remaining oil resource consists of both mobile and immobile oil, and portions of both are producible. We estimate about 76 billion barrels. But in both cases, we need

- o improved understanding and prediction of heterogeneities and flowpaths in the reservoir; and

- o increased predictability and cost-effectiveness of extraction techniques.

Learning how to produce more of the oil that has already been found will help us to slow the rate of decline of domestic oil production.

R&D Program

At a public meeting in Washington, on January 31, Deputy Secretary of Energy Henson Moore announced a fundamental restructuring of the Department's oil and gas R&D program -- from an emphasis on long-term, high-risk basic research to emphasis on near- and mid-term applied research. The goal is more effective and widespread use of existing technology to keep marginal fields in production, until technology advances can substantially improve recovery efficiency in this decade.

In 1985 about 80 percent of our research funds went to improve basic knowledge; only about 20 percent was devoted to preventing abandonments and maximizing recovery. Now we are proposing to reverse these percentages -- to direct upwards of 75 percent of our R&D funds over the next decade to develop better reservoir knowledge and better recovery technologies so we can keep marginal fields producing, improve recovery rates, and capture a greater proportion of our vast existing oil resource.

Our program does not exclude long-term research. But it recognizes the sobering reality that, if we don't slow abandonments and improve production rates in this decade, there may not be much of a domestic industry left in the next one to benefit from basic research.

The Department is seeking an increase in our 1991 oil and gas R&D budget, compared to previous requests. We are asking for more than $54 million in 1991, twice the amount requested in 1990, and some $10 million more than our FY 1990 appropriation. We're proposing to put real financial muscle in this restructured program, and we anticipate working with industry to leverage these dollars in high potential projects.

We recognize the oil and gas sectors have many R&D needs. But within the Department we must prioritize our use of resources and direct them where we think the problem is most acute and the payback greatest. In our judgment, this first priority is preventing the abandonment of producing wells.

A study we released at the January meeting, based on data from more than 700 reservoirs in nine major oil producing states, concludes that nearly 60 percent of the known crude oil remaining in the lower-48 states could be left in abandoned or inactive oil fields by the turn of the century, even if oil prices return to the $30 a barrel range. If prices remain level, up to 70 percent of the currently discovered resource base could be abandoned in 10 years. Here in New Mexico, the remaining oil resources should be abandoned in the future at a slightly slower rate than for the nation as a whole, as

production in several large reservoirs should be maintained well into the next century.

These are disturbing numbers, not just for the industry, but also for the nation. They explain why the research emphasis is being shifted, and why marginal production and recovery efficiency are priorities.

Under this restructured R&D program, we have two objectives in the near term:

1) to develop, with industry, a much more thorough data base that tells us more about the fundamental characteristics of major reservoir types in the United States, analyzing the problems associated with enhanced oil recovery in such reservoirs; and

2) utilizing the information given by reservoir characterization, to identify in cooperation with industry those reservoirs that have high potential oil in place while at the same time being at great risk of near-term abandonment, and to begin working with industry to apply more effective recovery technologies in these high potential/at risk reservoir.

The goal will be to develop a better understanding of the architecture of the reservoir, how geologic variations affect production, which recovery techniques work best and why. We will also attempt to demonstrate the applicability of two important technological innovations: geologically

targeted in-fill drilling, and methods for modifying fluid flow through a reservoir.

In the near-term, we estimate an additional 15 billion barrels of oil could be recoverable with more effective use of existing technologies, like improved waterflooding and in-fill drilling. The Department will serve as a clearinghouse for information and technology transfer. In addition, we hope that DOE-funded R&D on specific types of fields will be performed by consortia of companies interested in that type of field, which will allow first-hand technology transfer to multiple companies. When we know one technology works in a particular type of field, we will get that information to producers with similar fields. The Oil Recovery Technology Partnership, which DOE initiated here in New Mexico with Sandia and Los Alamos National Laboratories, is helping to augment our technology transfer efforts both to independents and major producing companies.

In addition to reservoir characterization and technology transfer, we see a few other promising R&D opportunities in the near-term. Approaches to temporary well abandonment and economically reversible well plugging, for example, could permit some degree of reentry into closed fields, at least for testing and evaluation. This concept warrants attention.

If we can keep high-risk reservoirs in production over the next five years or so, then by the mid-term we should start to see technology advances that will really begin to improve recovery. An additional 61 billion barrels of additional reserves could be recoverable in the mid-term. In this 1995 to

2000 period, program emphasis shifts from avoiding abandonment to maximizing recovery.

So far, I've talked only about oil. What about natural gas?

It is the Department's view that barriers to increased production and use of natural gas are mainly regulatory in nature. Identification of these barriers and analysis of options for regulatory reform are at the center of DOE's natural gas policy development efforts. These issues are being explicitly addressed in the Department's National Energy Strategy development process. Still, a coordinated research program with industry is needed. And, as with petroleum R&D, the emphasis is being shifted to more near-term, applied research.

In the near-term, we will concentrate on developing a comprehensive natural gas reservoir data base, comparable to that being developed for oil, and on improving conventional gas production. What do we have in mind with regard to improving conventional gas production?

In the mid-term we propose to increase emphasis on unconventional natural gas -- field-testing techniques for recovery from shales, tight sandstones, and geopressured aquifers. In the long-term, we may pursue research on recovery from speculative resources like deep basin gas and gas hydrates.

That summarizes the refocused oil and gas R&D program DOE is proposing for the 90's. This program has been shaped by the realities of the domestic

industry today. It seeks to shift program direction and funding toward more immediate, practical results and, equally important, to reinforce cooperation, both between government and industry and among companies with similiar interest.

As with many tough problems facing us, technology is a key to the solution. We believe that the gap between production costs and market value for oil and gas can be narrowed by technology. We are attempting to readjust our R&D effort to that immediate end.

The potential benefits of such a program, while difficult to project precisely, promise to be significant. The near-term and mid-term portions of this program could be responsible for the production of an additional 76 billion barrels of mobile and immobile oil -- three times our current proved reserves. This would be enough to slow the decline in U.S. production for three to four decades. The additional domestic supply would generate more than $400 billion in revenues to state and Federal treasuries, reduce the trade deficit by more than $2 trillion, and improve the Nation's energy security. And if this full 76 billion barrel potential were realized, it would still leave a long-term research target of approximately 265 billion barrels in known reservoirs.

These benefits can be achieved, however, only through an integrated R&D program. We believe we have begun to define such a program, and we look forward to working with the Congress, the states, and industry in implementing it.

Thank you. This concludes my prepared statement. I would be pleased to answer any questions you may have.

Senator BINGAMAN. Thank you very much. We will both have questions for you. Before we do, let's hear from the other two witnesses. Bill LeMay, we are very pleased to have you here today. Go right ahead.

STATEMENT OF WILLIAM LeMAY, DIRECTOR, DEPARTMENT OF ENERGY, MINERALS AND NATURAL RESOURCES, OIL CONSERVATION DIVISION, STATE OF NEW MEXICO

Mr. LEMAY. Thank you, Mr. Chairman, Senator Domenici. I appreciate the opportunity to testify before this subcommittee. I want to especially, on behalf of the state of New Mexico, I think we're very fortunate to have both of you on the Senate Energy Committee and we appreciate the fine work you are doing in Washington.

The oil conservation division regulates the drilling for, production of, and injection operations related to exploitation of crude oil, natural gas and geothermal resources within our state. The division's primary statutory mandates are the prevention of waste and the protection of correlative rights.

Our work is accomplished through offices located in Santa Fe, Artesia, Aztec and Hobbs, New Mexico. It is mainly through our field offices in Artesia, Aztec and Hobbs that we have contact with industry personnel in the field. We know you are here in the field to collect that kind of data. That's relatively rare in Washington.

We are witnessing an accelerating shortage of experienced personnel, especially on drilling rigs and on workover rigs. That is not to say that at the present time safety is being compromised. However, this last bust cycle, which we are still in, has resulted in many of our experienced hands leaving the industry permanently. The word in the patch says, "You can get a hand, but you cannot get a good hand."

I understand that current demand is so great for qualified personnel in the field that the oil field training center cannot keep full-time students enrolled through graduation. Operators and service companies are hiring students currently enrolled in the oil field training center. I guess the word needs to get out that jobs are out there and supply cannot keep up with current demand.

This is not to say that there is a boom going on. Certainly far from it. Operators and service companies are finding that they must operate their businesses on thinner and thinner margins of profit than ever before. This adds to the pressure to reduce costs and to stay competitive.

It has been our observation that those individuals with 20 to 30 years of experience, the ones who are the leaders and the ones who teach the new entries into our industry, are either retiring early or have left our industry for good. That high level of expertise once present in the oil patch is currently lacking.

In terms of remedial action on wells, cementing procedures, water disposal problems and just general operating procedures in the oil field and oil patch here in New Mexico, we are hearing comments like, "What should we do?" rather than, "This is what I intend to do," like we used to hear before.

All of this is taking place at a time when society is really demanding more and more accountability from our petroleum indus-

try, especially in environmental areas. We at the state level are experiencing more public pressure for minimum standards set by federal government or federal oversight of state programs, especially in oil and gas waste management areas, public hearings on permit applications, citizen advisory groups which oversee our regulatory functions, cessation of operations in the field if violations are uncovered, objections to economics being a factor in environmental compliance.

There is also a tendency to push down accountability and responsibilities to lower and lower levels in the field. Much of this is probably due to the fact that many companies are currently not clear on what the public is truly demanding in the way of responsibility and accountability, again, especially in the environmental areas.

In general, the bigger the company, the higher the technical level of expertise that is available. Quite frankly, many of the smaller independents are just trying to keep their financial heads above water in an industry where more and more knowledge is necessary, especially in such areas as gas marketing and environmental compliance. More knowledge, more experienced personnel, more work, more money, all from a declining pot of cash flow.

In summary, I would say that the current state of our industry infrastructure and work force is able to meet the energy demands of today with a level of activity that we currently see in the oil patch. However, we desperately need a higher level of U.S. drilling activity to replace the natural depletion of our domestic oil and gas reserves and to reverse the current trends of increasing foreign imports.

We need more domestic drilling, but I do not think we have the work force, especially the trained work force, to respond to significant higher levels of activity. In other words, I think at a minimum we need to double our national rig count to about 2,000 rigs operating in this country.

But even if the iron is out there, I don't think there are the experienced hands to man it. I think it would take us a minimum of two to three years to crank up to a level of activity which is necessary to ensure national and economic energy security in our nation.

Finally, I'd like to comment a little bit on maybe what are some of the things that we might do to help reverse these trends, and most of these, of course, you're both very familiar with and work hard to implement. The national energy strategy or policy that Senator Domenici referred to and that the previous panelist commented on is vitally necessary. This strategy can articulate at the highest level of our government the energy goals that we as a country would need to pursue in the national interest and the ways to achieve those goals.

A few of those areas can certainly be in tax incentives. Minimum tax clearly prevents capital from entering the business. If you drill too many wells, you start spending higher dollars and that doesn't make any financial sense.

The tertiary incentives that Senator Domenici's bill has enumerated—and, Senator Bingaman, you certainly have introduced legislation which is beneficial in the tax incentive area—I think tax incentives are cost-effective. When we're talking about incremental

oil, that's oil that would not be produced if it were not for the tax incentive, so there is no cost to the country net there.

I think we can open up the promising areas for exploration and development that are currently in a freeze, the big field off California that can't even be produced yet.

And certainly in the area of regulatory reform, I think we, in both state and federal government, need to reduce and certainly hopefully eliminate all areas of regulatory uncertainty. When you take FERC decisions that the courts overturn, I don't know how you unscramble an egg, but that seems to be what they're asking us to do in many cases.

With all these in place, there is no doubt that the price of oil and gas and the bottom line is dictating the activity we see, and that's something we have no control over. But we certainly in any way we can help to bring about a higher level of activity in our country to replace our declining reserves and increase our deliverability.

Thank you very much for the opportunity to testify.

[The prepared statement of Mr. LeMay follows:]

STATE OF NEW MEXICO
ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT
OIL CONSERVATION DIVISION

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April 4, 1990

Senator Jeff Bingaman
Suite 175
Federal Building
Roswell, New Mexico 88201

RE: Testimony Before the U.S. Senate Subcommittee on Mineral Resources Development and Production of the Senate Committee on Energy and Natural Resources Pertaining to Domestic Energy Needs of the 1990s and Industry's Ability to Respond to those Needs.

Dear Senator Bingaman:

The Oil Conservation Division regulates the drilling for, production of and injection operations related to exploitation of crude oil, natural gas and geothermal resources in our state. The division's primary statutory mandates are the prevention of waste and the protection of correlative rights. Our work is accomplished through offices located in Santa Fe, Artesia, Aztec and Hobbs, New Mexico. It is mainly through our field offices in Artesia, Aztec and Hobbs that we have contact with industry personnel in the field. We are witnessing an accelerating shortage of experienced personnel especially on drilling rigs and workover rigs. That is not to say at the present time that safety is being compromised; however, this last bust cycle which we are still in has resulted in many of our experienced hands leaving the industry permanently. The word in the patch is "you can get a hand, but you cannot get a good hand". I understand that current demand is so great for qualified personnel in the field, that the oil field training center cannot keep full-time students enrolled through graduation. Operators and service companies are hiring students currently enrolled in the oil field training center. I guess the word needs to get out that the jobs are out there and supply cannot keep up with demand. This is not to say that there is a boom going on. Operators and service companies are finding that they must operate their business on a thinner margin of profit then ever before. This adds to the pressure to reduce costs to stay competitive. It has been our observation that those individuals with 20 to 30 years of experience, the ones who are the leaders and who teach the new entries into the industry, are either retiring early or have left the industry for good. That high level of expertise once present in the oil patch is currently lacking. In terms of remedial action on wells, cementing procedures, water disposal problems and general operating procedures, we are hearing comments like "what should we do" rather than "this is what I intend to do".

All of this is taking place at a time when society is demanding more accountability from our petroleum industry especially in the environmental area. We at the state level are experiencing more public pressure for: 1) minimum standards set by federal government – or federal oversite of state programs, especially in oil and gas waste management areas; 2) public hearings on permit applications; 3) citizen - agency advisory bodies; 4) cessation of operations in the field if violations are uncovered; 5) objections to economics being a factor in environmental compliance. There is also a tendency to push down accountability and responsibility to lower and lower levels in the field. Much of this is probably due to the fact that many companies are not clear on what the public is demanding in the way of responsibility in environmental areas. In general, the bigger the company the higher the technical level of expertise that is available. Quite frankly, many of the smaller independents are just trying to keep their financial head above water in an industry where more and more knowledge is necessary in such areas as gas marketing and environmental compliance. More knowledge, more experienced personnel, more work, more money – all from a declining cash flow.

In summary, I would say that the current state of our industry infrastructure and work force is able to meet the energy demands of today with the level of activity that we currently see in the oil patch. However, we desperately need a higher level of U.S. drilling activity to replace the natural depletion of our domestic oil and gas reserves and to reverse the current trends of increasing foreign imports. We need more domestic drilling but I do not think we have the work force to respond to significant higher levels of activity. In other words, I think at a minimum we need to double our rig count to 2,000 rigs operating in this country, but even if the iron is out there, there aren't the experienced hands to operate the equipment. I think it would take us a minimum of 2 to 3 years to crank up to a level of activity which is necessary to ensure national and economic energy security in our nation.

Thank you for the opportunity to testify before this committee.

Very truly yours,

William J. LeMay
Director

WJL/sl

Senator BINGAMAN. Thank you very much. We appreciate that. We'll have some questions for you, I'm sure, here. First let's hear from Charles Lehman from the New Mexico Department of Labor.

STATEMENT OF CHARLES LEHMAN, ECONOMIC ANALYST, ECONOMIC RESEARCH BUREAU, NEW MEXICO DEPARTMENT OF LABOR

Mr. LEHMAN. Mr. Chairman, Senator Domenici, the New Mexico Department of Labor appreciates the opportunity to testify before you today. My testimony is primarily statistical data on the employment situation in the U.S. and in New Mexico oil and gas industry. It's in a paper that both of you have been provided. Let me just summarize some of the highlights of those statistical tables.

Historically, oil and gas began building, as far as employment goes, in 1973—the U.S. figure at that time was 275,000 workers employed in the industry—peaked in 1982 at just over 700,000 workers. Current employment in the oil and gas industry is 420,000 workers, down considerably from the 1982 figure.

New Mexico followed that trend very closely. We had just over 7,000 workers in the industry in 1973, peaked in 1982 at 16,000 workers, 16,300, and are currently at 8,400 workers in the industry, about half the employment figure that existed in 1982.

Industry employment in New Mexico is widely spread among a number of very small companies. We have approximately 600 companies in the industry in state. Only 14 of those have over 100 workers.

Geographically, employment is concentrated in Lea County, with about half of the employment in the industry, a quarter in San Juan County, smaller amounts in Eddy, Chaves and Rio Arriba Counties.

As far as the occupational structure of the industry goes, about half of the work force nationally are in production and operations. The other half are support, either engineering, technical, administration or clerical.

In New Mexico, the proportion is much higher on the production and operation side. We have about 70 percent of our work force actually doing field work. That includes about 31 percent working as roustabouts or well-servicing operators. That 30 percent is double the trend you see nationally.

As far as income goes, this is a very high-paying industry. The average weekly wage in oil and gas in New Mexico is $510 a week. This compares with the state average of all private industries of $338.

Current shortages for workers in the industry as identified by our state Department of Labor field offices are scattered about the state. We see an unmet need for well-servicing roustabouts, rig-up drivers and welders at the current time.

As far as projections go—as Senator Domenici has indicated, a very difficult thing to do—the most recently released projections as far as employment goes were made by the U.S. Department of Labor in the last four months. They show out to the year 2000 an estimated employment nationally of 416,000 workers. That compares with a current employment of 420,000, so it's almost un-

changed, down one percent. They have a range there of anywhere from 385,000 to 493,000 workers.

Their estimates are based on assumptions they received from the Department of Energy about two years ago. They are working on a scenario that sees oil per barrel in the year 2000 of $47.62—that's not in inflation-adjusted dollars—and they have an assumption of imports declining to 44 percent at that time.

For the New Mexico projection, we followed the national projections fairly closely on this. We have an employment projection in the year 2000 of 7,700 workers in the oil and gas industry, assuming that national projections are right and going along with the national assumptions that they used from the Department of Energy. That compares with a current employment of 8,400 workers, so that would show a decline of about eight percent in the New Mexico work force.

As far as occupations go, the trends are for more technical work force in the oil industry. The national projections that show constant employment at the same time show an increase in need for petroleum engineers and geologists, while many of the extraction occupations remain constant over this time period.

We feel that even with a flat or declining industry, that there are a number of job needs in the industry, primarily due to replacement and turnover needs. Based on some estimates that we made in the late 1980's in New Mexico when the industry was declining, looking at just four occupations, rotary drill operators, derrick operators, service unit operators and roustabouts, we had an estimate of nearly 300 job openings a year in that area for net replacement.

Our understanding of the industry is that many of the workers, many of the experienced workers, have either left the industry or, in the case of New Mexico, left the state. Should there be a major significant increase in the industry, either short term or long term, there would be a shortage of such workers.

In closing, I would like to say that we make constant occupational and industrial projections of the industry. Our next set is due out within the year and we will try to take into account any new assumptions either nationally or locally as far as trends in the industry goes. Thank you.

[The prepared statement of Mr. Lehman follows:]

EMPLOYMENT IN THE NEW MEXICO OIL AND GAS INDUSTRY

ECONOMIC RESEARCH AND ANALYSIS BUREAU

NEW MEXICO DEPARTMENT OF LABOR

APRIL 1990

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TABLE OF CONTENTS

Overview 1

Employment, N.M. & U.S., 1969-2000 2

Employment, N.M. Monthly Jan. 1989 - Feb. 1990 3

Employment by New Mexico County 4

Employment by Major Companies 5

Employment by Occupational Category, U.S. 6

Employment by Occupational Category, N.M. 12

Employment Shortages Reported by Labor Service Centers 16

OVERVIEW

Employment in the oil and gas industry in New Mexico steadily increased from 1970 to 1982, rising from 7,100 workers to a peak of 16,300. Since 1982 it has declined at a fairly continuous rate to a level of 8,400 in early 1990. About 5,400 of this employment is in contract well servicing (SIC 138) and 3,000 in exploration and production (SIC 131,132).

National employment in the industry also rose beginning in 1973 from 274,000 workers to a peak of 702,000 in 1982 before declining to a level of 420,000 in late 1989.

Projected year 2000 employment levels for the industry made by the New Mexico Department of Labor in 1988 as part of its statewide occupational forecast system was 7,700 workers, down 8% from 1989. Corresponding national employment projections by the U.S. Department of Labor was for 416,000 workers in 2000, almost unchanged from 1988 levels.

Geographically, employment in the state is concentrated in four counties with 4,300 or about one-half found in Lea County as of mid 1989. Other counties with sizable concentrations are San Juan - 2000 (25%), Eddy 1200 (15%) and Chaves 700 (8%).

Currently, there are 597 oil and gas companies in New Mexico. Of these, fourteen had more than 100 employees in New Mexico as of mid 1989. The largest were Texaco, Conoco, Amoco, Phillips, and Meridian.

Occupational categories in the New Mexico petroleum industry are concentrated in production and operation, with over 70% of total oil and gas employment. Within this category, roustabout and service unit operators are the largest occupations, with about one-third of all oil and gas employment in the State. Nationally, there are proportionately more management, technical and clerical support skills, with production and operations jobs providing only 50% of the total oil and gas workforce.

Current industry worker shortages reported by the N.M. Department of Labor Service Offices are for welders, well servicing roustabouts, and rig-up drivers. Because many workers have left the industry or State, there may be general labor shortages in the industry should hiring activity significantly increase in the future.

OIL & GAS INDUSTRY EMPLOYMENT
1969–1989 & 2000

	UNITED STATES	NEW MEXICO
1969	279,900	7,900
1970	270,100	7,100
1971	264,200	7,100
1972	267,900	7,000
1973	273,900	7,200
1974	300,200	8,300
1975	328,800	8,900
1976	345,700	8,300
1977	381,400	9,200
1978	429,300	9,900
1979	474,200	11,000
1980	559,700	13,400
1981	686,200	16,300
1982	701,500	15,400
1983	639,800	13,000
1984	626,700	13,300
1985	615,900	13,400
1986	463,600	10,000
1987	425,100	8,900
1988	417,100	9,100
1989	420,000 1/	8,400
2000 (PROJECTED)	416,000	7,700

1/ LATE 1989, ANNUAL AVERAGE NOT AVAILABLE

SOURCE: U.S. Department Of Labor, "Employment and Earnings" and "Monthly Labor Review"
N.M. Department of Labor, Nonagricultural Wage and Salary Employment, "N.M. Workforce 2000"

NEW MEXICO EMPLOYMENT TOTALS FOR OIL & GAS INDUSTRY (SIC 13)

1989	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
	8,274	8,118	8,163	8,267	8,351	8,394
	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
	8,311	8,381	8,489	8,550	8,737	8,790

1990	JANUARY	FEBRUARY
	8,593	8,410

Source: New Mexico Department of Labor

NEW MEXICO EMPLOYMENT BY COUNTY, OIL & GAS INDUSTRY (SIC 13), SELECTED COUNTIES

	JULY 1989	AUGUST 1989	SEPTEMBER 1989
LEA	4,371	4,346	4,374
CHAVES	701	681	667
SAN JUAN	1,966	2,132	2,238
EDDY	1,198	1,189	1,211
STATE	8,478	8,610	8,734

Source: New Mexico Department of Labor

MAJOR NEW MEXICO OIL AND GAS INDUSTRY COMPANIES

COMPANIES	COUNTIES
TEXACO	LEA
CONOCO	LEA, SAN JUAN
AMOCO PRODUCTION	DONA ANA, EDDY, LEA, SAN JUAN, UNION
PHILLIPS PETROLEUM	EDDY, LEA, SAN JUAN
MERIDEAN OIL	SAN JUAN
CHEVRON	LEA, SAN JUAN
YATES PETROLEUM	EDDY
HALLIBURTON	EDDY, LEA, SAN JUAN
WESTERN CO. OF NORTH AMERICA	EDDY, LEA, SAN JUAN
HONDO OIL & GAS	CHAVEZ
ARAPAHOE DRILLING	SAN JUAN
X-PERT WELL SERVICE	LEA
DA&S OIL WELL SERVICING	LEA
ATLANTIC RICHFIELD	EDDY, LEA, SAN JUAN

COMPANIES WITH AT LEAST 100+ EMPLOYEES AS OF JUNE 1989

NMDOL / ER&A 3/90

Mining

This industry division comprises establishments engaged in the extraction of minerals, liquids, and gases, such as coal, ores, crude petroleum, and natural gas. It also includes the exploration and development of mineral properties and other preparations customarily done at the mine site, or as part of the mining activity.

In 1987, mining employed approximately 712,000 workers, or 2.4 percent of all workers in the surveyed industries.

Mining, except oil and gas extraction

Establishments in this industry group (SIC's 10, 11, 12, and 14) are primarily engaged in metal mining, anthracite mining, bituminous coal and lignite mining, and mining and quarrying of nonmetallic minerals, except fuels.

Of the 318,200 workers in the mining industry in 1987, over half were engaged in mining bituminous coal and lignite (SIC 12). Thirty-five percent worked in mining and quarrying of nonmetallic minerals, except fuels (SIC 14); 13.5 percent in mining metals (SIC 10); and less than 1 percent in mining anthracite (SIC 11). (See tables 4-7.)

Total employment in mining, except oil and gas extraction, declined by 14.0 percent between 1984 and 1987. The percentage changes for each 3-digit SIC industry are shown in text table 1.

Employment in metal mining (SIC 10) includes establishments primarily engaged in mining, developing mines, or exploring for metallic minerals (ores). These ores are valued chiefly for the metals they contain, which are recovered for use as metals or as constituents of alloys, chemicals, pigments, etc.

Between 1984 and 1987, employment in metal mining declined from 57,680 to 42,980 workers, or by more than 25 percent. As shown in text table 1, the largest percentage decline occurred in ferroalloy ores, except vanadium, at nearly 60 percent.

The five occupations with the largest concentrations of bituminous coal and lignite mining workers (SIC 12) are listed below. Together, they constituted 25 percent of total industry employment.

	Employment, 1987	*Percent of industry employment*
Grader, dozer, and scraper operators	11,110	6.9
Helpers, laborers, and material movers, hand	10,160	6.3
Roof bolters	6,850	4.3
Underground mine machinery mechanics	6,240	3.9
First-line supervisors/managers supervisors, construction and related workers	5,940	3.7

The five occupations with the highest proportion of total employment in the nonmetallic mineral mining industry, excluding fuels (SIC 14), are listed below. They accounted for over 31 percent of total industry employment.

	Employment, 1987	*Percent of industry employment*
Truckdrivers, heavy or tractor-trailer	12,970	11.5
Excavating and loading machine operators	7,330	6.5
Crushing, grinding, mixing, and blending machine operators and tenders	7,100	6.3
Maintenance repairers, general utility	4,460	4.0
First-line supervisors/managers supervisors, construction and related workers	3,280	2.9

Text table 1. Mining, except oil and gas extraction: Employment by industry, 1984-87

Industry	SIC code	Employment		Percent change, 1984-87
		1984	1987	
Iron ores	101	12,380	6,720	-45.7
Copper ores	102	17,380	13,020	-25.0
Lead and zinc ores	103	3,320	2,380	-28.3
Gold and silver ores	104	10,710	12,670	18.3
Bauxite and other aluminum ores	105	200	100	-50.0
Ferroalloy ores, except vanadium	106	4,180	1,680	-59.8
Metal mining services	108	3,290	3,290	-16.0
Miscellaneous metal ores	109	5,580	3,100	-44.4
Anthracite mining	111	2,780	2,200	-20.8
Bituminous coal and lignite mining	121	198,700	160,590	-19.1
Dimension stone	141	3,490	4,190	20.0
Crushed and broken stone	142	36,280	40,990	12.9
Sand and gravel	144	34,690	35,400	2.0
Clay and related minerals	145	8,480	7,900	-6.8
Chemicals and fertilizer minerals	147	20,800	16,900	-18.7
Miscellaneous nonmetallic minerals	149	6,390	6,190	-3.1

Oil and gas extraction

This industry (SIC 13) consists of establishments engaged in the production of crude petroleum, natural gas, and cycle condensate, and also includes the recovery of oil from oil sands and oil shale.

Source: U.S. Department of Labor Occupational Employment in Mining, Construction, Finance and Services, Bulletin 2330, May 1989

In 1987, the oil and gas extraction industry employed 393,700 workers, or 55 percent of all workers employed in mining. Production and related workers made up the majority with 200,000, or over 50 percent of employment in oil and gas extraction (table 8). This major occupational group was followed by professional, paraprofessional, and technical workers, with 85, 580, or 22 percent of industry employment, and clerical and administrative workers with 59,720, or 15 percent.

Text table 2. Oil and gas extraction: Employment by industry, 1984-87

Industry	SIC code	Employment		Percent change, 1984-87
		1984	1987	
Crude petroleum and natural gas	131	256,090	197,070	-23.0
Natural gas liquids	132	6,610	5,770	-12.6
Oil and gas field services	138	335,490	190,900	-43.0

Employment in the oil and gas extraction industry declined by over 34 percent between 1984 and 1987. As shown in text table 2, the employment decline was greatest in the oil and gas field services industry (SIC 138).

The five occupations having the most employment in the oil and gas extraction industry are listed in the tabulation below. These jobs made up nearly 28 percent of total industry employment.

	Employment, 1987	*Percent of industry employment, 1987*	*Percent change in employment, 1984-87*
Roustabouts	36,850	9.4	-52.0
Service unit operators	20,010	5.1	-34.0
Secretaries	17,710	4.5	-32.6
First-line supervisors/ manager supervisors, construction and related workers	17,120	4.4	8.3
Geologists, geophysicists, and oceanographers	16,060	4.1	-21.0

Table 8. Oil and gas extraction: Employment, relative error, and percent of establishments reporting selected occupations, May 1987

(SIC 13)

Occupation	Employment[1]	Percent of total employment	Relative error (in percentage)[2]	Percent of establishments reporting the occupation
Total	393,700	100.00	—	—
Managerial and administrative occupations	37,820	9.61	n.a.	n.a.
Financial managers	5,330	1.35	9	26
Personnel, training, and labor relations managers	900	23	10	7
Purchasing managers	780	20	15	5
Marketing, advertising, and public relations managers	830	21	13	5
Administrative services managers	1,030	26	12	6
Engineering, mathematical, and natural sciences managers	2,840	72	9	8
Mining, quarrying, and oil and gas well drilling managers	7,240	1.84	8	30
General managers and top executives	14,280	3.63	7	47
All other managers and administrators	4,590	1.17	13	10
Professional, paraprofessional, and technical occupations	85,580	21.74	n.a.	n.a.
Management support workers	22,000	5.59	n.a.	n.a.
Accountants, auditors, and other financial specialists	12,290	3.12	n.a.	n.a.
Accountants and auditors	10,250	2.60	8	18
Budget analysts	770	20	12	4
All other financial specialists	1,270	32	13	3
Purchasing agents, except wholesale and retail trade, and farm products	1,170	30	8	8
Personnel, training, and labor relations specialists	1,650	42	8	6
Cost estimators	190	05	23	1
Compliance officers and enforcement inspectors, except construction	360	09	12	3
All other management support workers	6,340	1.61	9	10
Engineers	21,330	5.42	n.a.	n.a.
Petroleum engineers	14,410	3.66	6	21
Chemical engineers	870	22	13	2
Civil engineers, including traffic	830	21	13	2
Electrical and electronic engineers	1,000	25	15	3
Industrial engineers, except safety	630	16	23	1
Safety engineers, except mining	340	10	14	4
Mechanical engineers	1,370	35	12	3
All other engineers	1,840	47	n.a.	n.a.
Surveying and mapping scientists	410	10	28	2
Engineering and related technicians and technologists	9,440	2.40	n.a.	n.a.
Civil engineering technicians and technologists	720	18	24	1
Electrical and electronic engineering technicians and technologists	880	17	21	3
Mechanical engineering technicians and technologists	500	13	34	1
Drafters	3,400	86	9	9
Surveying and mapping technicians and technologists	760	19	18	3
All other engineering and related technicians and technologists	3,380	86	12	6
Natural scientists and related workers	80	02	n.a.	n.a.
Physical scientists	16,900	4.29	n.a.	n.a.
Chemists, except biochemists	430	11	24	2
Geologists, geophysicists, and oceanographers	16,060	4.08	7	18
All other physical scientists	410	10	15	2
Life scientists	80	02	28	(3)
Physical and life science technicians and technologists	5,580	1.42	n.a.	n.a.
Chemical technicians and technologists, except health	340	09	23	1

See footnotes at end of table.

Table 8. Oil and gas extraction: Employment, relative error, and percent of establishments reporting selected occupations, May 1987—Continued

(SIC 13)

Occupation	Employment[1]	Percent of total employment	Relative error (in percentage)[2]	Percent of establishments reporting the occupation
Petroleum technicians and technologists	3,980	1.01	10	6
All other physical and life science technicians and technologists	1,260	.32	19	3
Computer scientists and related workers	5,380	1.37	n.a.	n.a.
Systems analysts, electronic data processing	2,740	.70	10	5
Computer programmers	1,910	.49	10	6
Computer programmer aides	730	.19	30	3
Economists, including market research analysts	340	.09	33	1
Lawyers	1,040	.26	14	4
Legal assistants and technicians, except clerical	240	.06	22	2
Health practitioners, technologists, technicians, and related health workers	120	.03	17	1
Public relations specialists and publicity writers	130	.03	18	1
All other professional, paraprofessional, and technical workers	2,590	.66	n.a.	n.a.
Sales and related occupations	7,320	1.86	n.a.	n.a.
First-line supervisors and manager/supervisors, sales and related workers	2,400	.61	14	12
Sales engineers	1,370	.35	22	5
Sales representatives, scientific and related products and services, except retail	2,380	.60	15	7
Sales representatives, except scientific and related products or services and retail	470	.12	26	2
All other sales and related workers	700	.18	26	2
Clerical and administrative support occupations	59,720	15.17	n.a.	n.a.
First-line supervisors and manager/supervisors, clerical and administrative support workers	3,960	1.01	8	12
Secretaries	17,710	4.50	5	45
Stenographers	250	.06	25	2
Receptionists and information clerks	1,800	.46	12	13
Typists	650	.17	32	2
Typists, word-processing equipment	760	.19	13	3
Personnel clerks, except payroll and timekeeping	600	.15	10	5
File clerks	1,140	.29	14	4
Order clerks, materials, merchandise, and service	480	.12	18	2
Bookkeeping, accounting, and auditing clerks	11,880	3.02	7	35
Payroll and timekeeping clerks	610	.15	11	6
Billing, cost, and rate clerks	580	.15	13	3
General office clerks	10,680	2.71	8	30
Electronic data processing and other office machine operators	3,140	.80	n.a.	n.a.
Computer operators, except peripheral equipment	1,640	.42	10	6
Data entry keyers, except composing	880	.22	12	4
All other office machine operators	620	.16	16	3
Switchboard operators	660	.17	11	6
Material recording, scheduling, dispatching, and distributing workers	3,670	.93	n.a.	n.a.
Dispatchers, except police, fire, and ambulance	1,020	.26	14	5
Production, planning, and expediting clerks	1,230	.31	15	4
Stock clerks, stockroom, warehouse, or storage yard	1,080	.27	14	5
All other material recording, scheduling, and distributing workers	340	.09	23	2

See footnotes at end of table.

Table 8. Oil and gas extraction: Employment, relative error, and percent of establishments reporting selected occupations, May 1987—Continued

(SIC 13)

Occupation	Employment[1]	Percent of total employment	Relative error (in percentage)[2]	Percent of establishments reporting the occupation
All other clerical and administrative support workers	1,150	0.29	12	3
Service occupations	2,829	.72	n.a.	n.a.
First-line supervisors and manager/supervisors, service	370	.09	20	2
Guards and watch guards	330	.08	24	2
Food and beverage preparation and service workers	310	.08	45	1
Cleaning and building service workers, except private households	1,610	.41	n.a.	n.a.
Janitors and cleaners, except maids and housekeeping cleaners	1,610	.41	26	7
All other service workers	200	.05	n.a.	n.a.
Agriculture, forestry, fishing, and related occupations	310	.08	n.a.	n.a.
Gardeners and groundskeepers, except farm	170	.04	46	1
All other agriculture, forestry, fishing, and related workers	140	.04	n.a.	n.a.
Production, construction, operating, maintenance, and material handling occupations	200,130	50.83	n.a.	n.a.
First-line supervisors, manager/supervisors - production, construction, maintenance, and related workers	22,890	5.81	n.a.	n.a.
First-line supervisors and manager/supervisors - mechanics, installers, and repairers	1,510	.38	22	7
First-line supervisors and manager/supervisors - construction trades and extractive workers	17,120	4.35	6	38
First-line supervisors and manager/superv-transp and material moving machine and vehicle workers	740	.19	25	4
First-line supervisors and manager/supervisors - helpers, laborers, and material movers, hand	660	.17	23	2
All other first-line supervisors and manager/supervisors - production, construction and maintenance workers	2,860	.73	18	5
Precision inspectors, testers, and graders	1,560	.40	39	2
Production inspectors, testers, graders, sorters, samplers, and weighers	1,300	.33	29	2
Mechanics, installers, and repairers	16,670	4.23	n.a.	n.a.
Machinery maintenance mechanics	5,930	1.51	13	18
Machinery maintenance workers	290	.07	48	1
Maintenance repairers, general utility	5,660	1.44	12	18
Selected mobile equipment mechanics, installers, and repairers	1,620	.41	n.a.	n.a.
Automotive mechanics	520	.13	22	2
Bus and truck mechanics and diesel engine specialists	700	.18	17	4
Mobile heavy equipment mechanics, except engines	400	.10	22	2
Precision instrument repairers	1,370	.35	16	4
Mechanical control and valve installers and repairers	640	.16	22	2
Riggers	250	.06	50	1
All other mechanics, installers, and repairers	910	.23	22	3
Construction trades workers, except material moving	2,970	.75	n.a.	n.a.
Carpenters	100	.03	39	1
Electricians	1,900	.48	17	5
All other plumbing and related workers	280	.07	n.a.	n.a.
All other construction trades workers	690	.18	34	1

See footnotes at end of table.

Table 8. Oil and gas extraction: Employment, relative error, and percent of establishments reporting selected occupations, May 1987—Continued

(SIC 13)

Occupation	Employment[1]	Percent of total employment	Relative error (in percentage)[2]	Percent of establishments reporting the occupation
Extractive and related workers, including blasters	84,150	21.37	n.a.	n.a.
Blasters and explosives workers	130	.03	48	1
Rotary drill operators, oil and gas extraction	11,830	3.00	14	14
Derrick operators, oil and gas extraction	7,470	1.90	12	11
Service unit operators	20,010	5.08	9	22
Roustabouts	36,850	9.36	6	37
All other extractive workers, except helpers	7,860	2.00	n.a.	n.a.
All other construction and extractive workers, except helpers	440	.11	n.a.	n.a.
Machinists	340	.09	34	1
All other precision workers, n.e.c.	330	.08	49	(3)
Machine setters, setup operators, and tenders, metal and plastic	60	.02	n.a.	n.a.
Machine setters, setup operators, and tenders, except metal and plastic	1,140	.29	n.a.	n.a.
Separating, filtering, clarifying, precipitating, and still machine operators and tenders	340	.09	45	1
All other machine operators and tenders, except metal and plastic	800	.20	30	1
Welders and cutters	2,830	.72	13	10
Plant and system workers	8,560	2.17	n.a.	n.a.
Gas plant operators	1,640	.42	43	3
Petroleum pump system operators	530	.13	32	1
Petroleum refinery and control panel operators	1,540	.39	34	1
Gaugers	2,570	.65	35	2
Stationary engineers	420	.11	35	1
All other plant and system operators	1,860	.47	27	2
Motor vehicle operators	12,260	3.11	n.a.	n.a.
Truckdrivers, heavy or tractor-trailer	11,730	2.98	11	21
Truckdrivers, light, including delivery and route workers	530	.13	31	2
Aircraft pilots and flight engineers	410	.10	19	2
All other transportation and related workers	910	.23	n.a.	n.a.
Material moving equipment operators	31,630	8.03	n.a.	n.a.
Oil pumpers, except well head	10,800	2.74	19	13
Well head pumpers	9,650	2.45	15	15
Grader, dozer, and scraper operators	5,330	1.35	16	9
Hoist and winch operators	1,180	.29	44	1
Crane and tower operators	890	.18	45	2
Industrial truck and tractor operators	380	.10	40	1
Pump operators	1,650	.42	35	1
Operating engineers	890	.23	32	1
All other material moving equipment operators	1,080	.27	42	1
All other transportation and material moving equipment operators	1,220	.31	n.a.	n.a.
Helpers - mechanics and repairers	860	.22	32	2
Construction trades and extractive worker helpers	1,480	.38	23	3
Freight, stock, and material movers, hand	710	.18	32	2
All other helpers, laborers, and material movers, hand	6,930	1.76	15	7
All other production, construction, operating, maintenance, and material handling workers	480	.12	n.a.	n.a.

[1] Estimates of fewer than 50 workers, or with less than 0.01 percent of industry employment, or with a relative error greater than 50 are generally not shown separately since such estimates are considered unreliable. Estimates that are not shown have been counted in the appropriate "All other" categories.

[2] Relative standard errors apply equally to data on estimated employment and percent of total employment; relative standard errors are estimated at the level of 2 chances out of 3. For further information on sampling variability and other types of errors, see appendix A.

[3] Less than 0.5 percent.

n.e.c. = not elsewhere classified.

n.a. = not available.

NOTE: Detail may not add to totals due to rounding. Estimated employment is rounded to the nearest 10.

OIL AND GAS EXTRACTION (SIC 13)

Well-site drilling jobs comprise most of the petroleum industry employment.

Occupations in the oil and gas extraction industry are concentrated in production, construction, operating, maintenance, and material handling skills. They comprise 71.64 percent of the total oil and gas extraction employment. Occupations that employ the largest number of workers include roustabouts; service unit operators; first line supervisors and manager/supervisors-production, construction, maintenance, and related occupations; and material moving equipment operators. Derrick operators, oil and gas extraction account for 4.8 percent of total industry employment.

Occupations with employment of 200 or more, ranked in descending order, Oil and Gas Extraction.

Occupation	Employment
1. Roustabouts	1,370
2. Service Unit Operators	1,250
3. First Line Supervisors and Manager/ Supervisors-Production, Construction, Maintenance, and Related Occupations	610
4. Material Moving Equipment Operators	600
5. General Managers and Top Executives	410
6. Derrick Operators, Oil and Gas Extraction	410
7. Rotary Drill Operators, Oil and Gas Extraction	360
8. Maintenance Repairers, General Utility	350
9. All other Extractive Workers, except Helpers	350
10. Engineers	270
11. Bookkeeping, Accounting, and Auditing Clerks	250
12. Machinery Maintenance Mechanics	220

SIC 13 OIL AND GAS EXTRACTION
REFERENCE DATE : MAY 12, 1987

JANUARY 31, 1989

OCCUPATION	EMPLOYMENT	PERCENT OF TOTAL EMPLOYMENT	RELATIVE ERROR (IN %)	ESTABLISHMENTS REPORTING OCCUPATION (%)
TOTAL	8,540	100.00	-	-
MANAGERIAL AND ADMINISTRATIVE OCCUPATIONS	660	7.71	N.A.	N.A.
FINANCIAL MANAGERS	60	0.70	26.97	21.28
MARKETING, ADVERTISING, & PUBLIC RELATIONS MANAGERS	10	0.11	44.12	4.26
ADMINISTRATIVE SERVICES MANAGERS	10	0.11	21.96	9.57
MINING, QUARRYING, AND OIL AND GAS WELL DRILLING MANAGERS	140	1.64	13.38	32.98
GENERAL MANAGERS AND TOP EXECUTIVES	410	4.80	17.28	64.89
PROFESSIONAL, PARAPROFESSIONAL, AND TECHNICAL OCCUPATIONS	640	7.44	N.A.	N.A.
ACCOUNTANTS, AUDITORS, AND OTHER FINANCIAL SPECIALISTS	70	0.81	N.A.	N.A.
ACCOUNTANTS AND AUDITORS	60	0.70	20.87	17.02
BUDGET ANALYSTS	10	0.11	34.98	2.13
PURCHASING AGENTS, EXCEPT WHOLESALE AND RETAIL TRADE, AND FARM PRODUCTS	10	0.11	20.46	6.38
ALL OTHER MANAGEMENT SUPPORT WORKERS	60	0.70	N.A.	N.A.
ENGINEERS	270	3.16	N.A.	N.A.
PETROLEUM ENGINEERS	270	3.16	14.08	26.60
SURVEYING AND MAPPING SCIENTISTS	10	0.11	37.23	1.06
ENGINEERING AND RELATED TECHNICIANS AND TECHNOLOGISTS	20	0.23	N.A.	N.A.
ELECTRICAL AND ELECTRONIC ENGINEERING TECHNICIANS AND TECHNOLOGISTS	20	0.23	30.28	4.26
ALL OTHER ENGINEERS AND RELATED OCCUPATIONS	80	0.93	N.A.	N.A.
PHYSICAL SCIENTISTS	30	0.35	N.A.	N.A.
GEOLOGISTS, GEOPHYSICISTS, AND OCEANOGRAPHERS	30	0.35	13.93	4.26
PHYSICAL AND LIFE SCIENCE TECHNICIANS AND TECHNOLOGISTS	40	0.46	N.A.	N.A.
PETROLEUM TECHNICIANS AND TECHNOLOGISTS	40	0.46	31.69	7.45
RESEARCH & DEVELOPMENT PROFESSIONAL, PARAPROFESSIONAL, AND TECHNICAL OCCUPATIONS	10	0.11	N.A.	N.A.
SALES AND RELATED OCCUPATIONS	180	2.09	N.A.	N.A.
FIRST LINE SUPERVISORS & MANAGER/SUPERVISORS, SALES AND RELATED OCCUPATIONS	20	0.23	33.34	5.32
SALES REPRESENTATIVES, SCIENTIFIC & RELATED PRODUCTS & SERVICES, EXCEPT RETAIL	80	0.93	30.74	9.57
SALES REPRESENTATIVES, EXCEPT SCIENTIFIC AND RELATED PRODUCTS OR SERVICES AND RETAIL	30	0.35	41.52	8.51
ALL OTHER SALES AND RELATED WORKERS	50	0.58	N.A.	N.A.
CLERICAL AND ADMINISTRATIVE SUPPORT OCCUPATIONS	820	9.57	N.A.	N.A.

SIC 13 OIL AND GAS EXTRACTION
REFERENCE DATE : MAY 12, 1987

JANUARY 31, 1989

OCCUPATION	EMPLOYMENT	PERCENT OF TOTAL EMPLOYMENT	RELATIVE ERROR (IN %)	ESTABLISHMENTS REPORTING OCCUPATION (%)
FIRST LINE SUPERVISORS AND MANAGER/SUPERVISORS-CLERICAL AND ADMINISTRATIVE SUPPORT OCCUPATIONS	30	0.35	27.62	11.70
SECRETARIES	190	2.22	16.15	39.36
RECEPTIONISTS AND INFORMATION CLERKS	30	0.35	27.46	13.83
BOOKKEEPING, ACCOUNTING, AND AUDITING CLERKS	250	2.93	15.81	38.30
PAYROLL AND TIMEKEEPING CLERKS	10	0.11	29.66	9.57
BILLING, COST AND RATE CLERKS	20	0.23	15.20	7.45
GENERAL OFFICE CLERKS	170	1.99	17.27	28.72
MATERIAL RECORDING, SCHEDULING, DISPATCHING, AND DISTRIBUTING WORKERS	40	0.46	N.A.	N.A.
DISPATCHERS- EXCEPT POLICE, FIRE, AND AMBULANCE	40	0.46	36.41	9.57
ALL OTHER CLERICAL AND ADMINISTRATIVE SUPPORT WORKERS	80	0.93	N.A.	N.A.
SERVICE OCCUPATIONS	50	0.57	N.A.	N.A.
CLEANING AND BUILDING SERVICE WORKERS, EXCEPT PRIVATE HOUSEHOLDS	40	0.46	N.A.	N.A.
JANITORS & CLEANERS, EXCEPT MAIDS & HOUSEKEEPING CLEANERS	40	0.46	26.60	6.38
AGRICULTURAL, FORESTRY, FISHING, AND RELATED OCCUPATIONS	70	0.82	N.A.	N.A.
ALL OTHER AGRICULTURAL, FORESTRY, FISHING, & RELATED WORKERS	70	0.82	N.A.	N.A.
PRODUCTION, CONSTRUCTION, OPERATING, MAINTENANCE, AND MATERIAL HANDLING OCCUPATIONS	6,120	71.64	N.A.	N.A.
FIRST LINE SUPERVISORS AND MANAGER/SUPERVISORS-PRODUCTION, CONSTRUCTION, MAINTENANCE, AND RELATED OCCUPATIONS	610	7.13	N.A.	N.A.
FIRST LINE SUPERVISORS AND MANAGER/SUPERVISORS, MECHANICS, INSTALLERS, AND REPAIRERS	40	0.46	29.82	12.77
FIRST LINE SUPERVISORS AND MANAGER/SUPERVISORS, CONSTRUCTION TRADES AND EXTRACTIVE WORKERS	470	5.50	11.54	58.51
FIRST LINE SUPERVISORS AND MANAGER/SUPERVISORS-TRANSPORTATION AND MATERIAL MOVING MACHINE AND VEHICLE OCCUPATIONS	100	1.17	17.57	14.89
PRECISION INSPECTORS, TESTERS, AND GRADERS	20	0.23	40.81	1.06
MACHINERY MAINTENANCE MECHANICS	220	2.57	28.14	25.53
MAINTENANCE REPAIRERS, GENERAL UTILITY	350	4.10	42.64	23.40
BUS AND TRUCK MECHANICS, AND DIESEL ENGINE SPECIALISTS	30	0.35	35.02	10.64
PRECISION INSTRUMENT REPAIRERS	20	0.23	15.76	5.32
CONSTRUCTION TRADES WORKERS, EXCEPT MATERIAL MOVING	30	0.35	N.A.	N.A.
ELECTRICIANS	30	0.35	36.90	6.38
ROTARY DRILL OPERATORS, OIL AND GAS EXTRACTION	360	4.22	21.74	15.96
DERRICK OPERATORS, OIL AND GAS EXTRACTION	410	4.80	17.38	17.02

SIC 13 OIL AND GAS EXTRACTION
REFERENCE DATE : MAY 12, 1987

JANUARY 31, 1989

OCCUPATION	EMPLOYMENT	PERCENT OF TOTAL EMPLOYMENT	RELATIVE ERROR (IN %)	ESTABLISHMENTS REPORTING OCCUPATION (%)
SERVICE UNIT OPERATORS	1,250	14.65	13.49	36.17
ROUSTABOUTS	1,370	16.06	11.92	47.87
ALL OTHER EXTRACTIVE WORKERS, EXCEPT HELPERS	350	4.10	27.71	8.51
OTHER HAND WORKERS, NEC	20	0.23	N.A.	N.A.
WELDERS AND CUTTERS	20	0.23	26.12	8.51
PLANT AND SYSTEM WORKERS	120	1.40	N.A.	N.A.
ALL OTHER PLANT AND SYSTEM OPERATORS	120	1.40	N.A.	N.A.
MOTOR VEHICLE OPERATORS	160	1.87	N.A.	N.A.
TRUCK DRIVERS, HEAVY OR TRACTOR TRAILER	160	1.87	23.00	15.96
MATERIAL MOVING EQUIPMENT OPERATORS	600	7.02	N.A.	N.A.
OIL PUMPERS, EXCEPT WELL HEAD	370	4.33	16.45	18.09
WELL HEAD PUMPERS	200	2.34	31.10	11.70
PUMP OPERATORS	30	0.35	38.91	1.06
ALL OTHER TRANSPORTATION & MATERIAL MOVING EQUIPMENT OPERATORS	40	0.46	N.A.	N.A.
FREIGHT, STOCK, AND MATERIAL MOVERS, HAND	20	0.23	47.18	4.26
ALL OTHER PRODUCTION, CONSTRUCTION, OPERATING, MAINTENANCE, AND MATERIAL HANDLING OCCUPATIONS	140	1.64	N.A.	N.A.

Source: New Mexico Department of Labor
"New Mexico Occupational Profiles 1990"

UNMET OIL & GAS SKILL NEEDS
REPORTED BY NMDOL SERVICE CENTERS, APRIL 1990

ARTESIA	PIPELINE AND RIG WELDERS
CARLSBAD	NONE
FARMINGTON	RIG-UP DRIVERS
HOBBS	ROUSTABOUTS, WELL-SERVICING
ROSWELL	NONE

Senator BINGAMAN. Thank you very much. Let me ask a few questions of the panel and then I'm sure Senator Domenici will have some also.

Mr. McElwrath, let me ask you first: The effort that the Department of Energy is going through to develop a strategy, are you going to have specific goals in that strategy that we could measure progress toward on a yearly basis as we go forward? I mean are you going to have in there a statement of where—I think you said that your goal—we've gotten away from the idea of energy independence and we're now trying to reduce the rate of growing dependence.

Are we going to have a specific goal for where we want to be, say, in 1995?

Mr. MCELWRATH. Senator, I think that our intention is definitely to move in that direction. We tend to agree with Senator Domenici that a document that simply compiles options and gives us a base table from which to work is valuable. That base table information is important, especially if there is some consensus about it.

However, as the senator said, if that's all that we have, we've got a document that ultimately will gather a lot of dust on the shelf. So we intend to come out with some very definitive recommendations. That will be a tough process. The way government works through the interagency process and obviously through coordination with Congress, it's a tough, arduous process, but one that's long overdue and we intend to undertake it.

Senator BINGAMAN. And you expect those specific policy decisions or recommendations to be concluded by the end of this year?

Mr. MCELWRATH. Yes, that's our goal. That's what the President has requested. We think it's very important to do so. As it is, those recommendations will be feeding in at the last minute to the 1992 budget process, but it's important that we have that input into the process.

Senator BINGAMAN. Should we expect to see some specific recommendation? I know you have a whole section in this report that you've just come out with on tax policy and various suggested incentives that might be listed over on page 47. Will you come down in favor of some of those specifically and recommend those to the Congress as part of next year's budget?

Mr. MCELWRATH. Well, my opinion is that we will. Obviously, there is a difficult balancing act to undertake there. But my opinion is that, based on discussions to this point, there is a definitive recognition that oil and gas will continue to be critical drivers of our economy for the next several decades, no matter what we do. There is a current recognition that domestic production is falling dramatically, and I believe that there ultimately will be a resolution that something needs to be done to stave off or minimize that decline.

Most of the public comment to this point indicates that that can only be done with a broad-ranging package that, as Mr. LeMay pointed out, would include tax incentives, regulatory reform, et cetera.

Senator BINGAMAN. Let me ask you about one piece, which we sort of have put off the agenda because it's been totally unacceptable to the previous administration and to many others in Con-

gress. But I have a lot of folks who are involved in the oil and gas industry who advise me that unless something can be done to stabilize the price of oil, you're never going to attract the investment back into this industry that is needed to keep the industry viable.

And that all the rest of it is nice and is a good thing to try to do, but that unless something can be done about the price of oil—I guess the price has varied several dollars here in the last few weeks, and I think that may be an indicator of a problem that I'm alluding to.

We stabilize the price of milk and shingles and various other things through various arrangements in government. Do you think there will be a recognition in this energy strategy that we need to do something to stabilize the price of oil?

Mr. McELWRATH. I think that there will definitely be a recognition that that is the overriding factor in whether or not production in this country takes off at a substantially increasing rate. Having said, though, that we'll recognize that factor, I would not be prepared today to predict whether or not we would come out with any kind of dramatic recommendations for a floor price.

The cross currents of doing that from a national perspective are really complex. Obviously, high oil prices in this country that are not matched by oil prices abroad mean something to our competitive posture here. That's certainly mitigated by the fact that our balance of payments right now is about 40 percent attributable to the import of foreign oil, and we can't ignore that factor.

But quite honestly, that will be the toughest call that we make because, as you stated, we have substantial resistance to any such concept of stabilizing prices with a floor price, or whatever, from all sectors of this nation. It's a very tough fight within the administration and it's a tough fight on Capitol Hill.

So I will say this. I think we will recognize the importance of stable prices but we've got a long ways to go before consensus is developed as to whether or not government takes affirmative action in that regard.

Senator BINGAMAN. So you are saying you may recognize it but unlikely to do anything about it.

Mr. McELWRATH. That's my guess.

Senator BINGAMAN. Bill LeMay, let me just ask you if there are things that you are aware of that are peculiar to our state in that there are things that we could do here in the state to improve the prospects for our own industry remaining viable, the oil industry in particular?

I think the gas industry's prospects are reasonably good over the long run and I think this meeting you just had in Santa Fe, I guess, demonstrates that. Are there things that we could do here in New Mexico that would help our own possibility of improving these employment figures that Mr. Lehman has given us, his projected employment figures in this industry?

Mr. LEMAY. Mr. Chairman, I think we try and do little things. I don't think there is any master stroke that can suddenly bring our industry back to health. Just to give you some of the ideas of some things that we're struggling with, but hopefully they will make a difference, we just will have a report on our low volume natural

gas committee, the purpose of which is to preserve these stripper wells that may be plugged, the stripper gas wells.

The statistics were kind of amazing, just listening to that 60 percent of our wells will be plugged or reservoirs will be abandoned in 1999 or the year 2000. So much of what we're trying to do is just preserve the continuing production from the wells that we have.

Small tax policies at the state and federal level will help that. We just went from a unit tax back to a percentage tax on natural gas, which keeps our gas competitive with other supply sources at the state level. I think these little tax incentives, small as they are, collectively can contribute to keeping our wells pumping longer.

The 9,000 wells we have out there in the state that are in some form of temporarily abandoned, shut in, these wells haven't been plugged. Of course, once you've plugged the well, you've probably lost that resource forever. But we are trying to get policies where if you insure the mechanical integrity of the casing, you can leave it there as long as you want. If you have plans for it, we're not saying the wells have to be plugged or anything else.

All this with recognizing the trends of the 1990's, being in the environmental area, I think it's a real challenge for all of us to work this oil patch and keep it producing and still keep it environmentally acceptable development.

Senator BINGAMAN. Thank you. I'd like to ask Mr. McElwrath one more question and then defer to Senator Domenici for his questions. You've indicated a change in real priorities on R&D spending and a shift toward more focus on short-range, what can be done in the short term to improve the situation, less of your funds going into the long-range.

If oil and gas research and development is going to make a significant difference, shouldn't we be seeing an overall increase in priority given to that activity?

I guess my concern is that you're essentially shifting money around within that line item. You're not shifting any additional resources into oil and gas research and development, unless I'm confused. Now, I understand that the budget you have given us this year does not indicate any significant increase over 1990's level of funding in research and development overall. Am I wrong about that?

Mr. MCELWRATH. If I'm correct in my math, we have requested a $10 million increase over the appropriated level of last year, up to a level of about $54 million, which essentially means a fairly significant 20 percent ramping up in our budget request.

In my opinion, we are at a critical juncture right now with our program. We have shifted to a short-term/near-term focus because of the priorities of preventing abandonment that I've already mentioned and because our efforts in the past have not been disseminated out to industry on a timely basis.

I think if we are successful in doing that and can demonstrate some tangible results in the next year or two, we will be coming back to you with an increase for higher budgets and, hopefully, having seen some progress, the Hill will be inclined to go with that.

Senator BINGAMAN. Senator Domenici.

Senator DOMENICI. Thank you very much, Mr. Chairman.

Let me first say to you, Mr. McElwrath, of all of the deputies that we had to confirm, you were the toughest one for me, not because of you, but because the Department for about 18 months finally had a deputy who was interested in fossil fuels and seriously interested in what you were telling us you were going to try to do. I hope you understand that.

Mr. MCELWRATH. I do understand that and I am in full concurrence with that. The previous deputy, I think, had started us down this road. I know that he had consulted with you on many occasions.

Senator DOMENICI. Not only with me, but with the independents in this state. And he was rather startled to find that they were genuinely interested in research. As a matter of fact, you might confer, if you haven't, with Dr. Martin from our enhanced recovery center over at New Mexico Tech. There is no better.

But if you're really interested in doing some research on enhanced recovery, we've been waiting a couple of years. They have a donated field from one of these people sitting right out here that's ready to go, turn it over to the government, contributing it, so we can do some real experimentation, and we don't make any headway. I hope we will see some headway.

Mr. MCELWRATH. We'll certainly look into that. That's the kind of opportunity that we're looking for. I want to emphasize one thing. Things like the floor price are tough. While I might individually advocate that, they are tough to get through. But we can do things in the research area. Hopefully we can do things in the tax incentive area.

And in a very practical sense, what we really want to do is understand the needs of the independent sector. The independent sector under the new tax regime finds it very hard to attract investors. They don't have the luxury of being able to miss too many times on a prospect or to be wrong too many times on utilizing a new technology.

And what they need is for us to find and utilize one of these fields, such as you're mentioning, demonstrate that technology so they have some comfort factor that utilizing that technology will not be a bust and will not put them down the tubes.

Senator DOMENICI. Let me just talk about the stable price notion that Senator Bingaman raised. Clearly it is hard in the United States, because of some of our basic philosophies about the marketplace, to have a stable price and agree that it will not be changed. But let me suggest that you and the secretary should know that there is a huge and growing enthusiasm in the Congress for a gasoline tax. I mean I've heard people say it's a must. I heard some northeastern congressmen say we ought to have 25 cents for starters next month.

Well, it seems to me that obviously if you can't get a stable price by fiat, that you can at least advocate policies that increase production. And, certainly, if anyone is thinking of a gasoline tax increase, the Department of Energy ought to be advocating an import fee as part of it. You get two for one. You get the conservation everybody is clamoring for, but, isn't it interesting, you get increased oil production at home.

I hope those kinds of things are being looked at. I'm certainly not in favor of a 25-cent gasoline tax, but I guarantee you some of us who are penalized tremendously by that will resist it, and certainly we will resist it for a long, long time. If it doesn't have some policies that increase American production, what's the use of it? You conserve some but we produce no more.

Having said that, let me ask: Do you know whether any research has been done on cost-effectiveness of various proposals? Is that going to be part of this plan?

Let me give you an example. We're going to spend $600 million this year for our strategic petroleum reserve. Some want to spend a billion. Frankly, I'd like to spend $100 million instead of $600 million. But I'd like to spend $500 million of that for tax incentives that produce oil. As a matter of fact, I believe with $100 million of that, you can address the abandonment issue that is throwing away oil.

Doesn't it seem kind of ridiculous to spend money to buy oil to put in the ground while we are throwing away oil that's in the ground that we already own for lack of an incentive to get it out of the ground?

You stated the abandonment figures, I didn't. I was quite shocked. What did you use? 60 percent under one economic scenario and 70 on another. That means oil we own, already discovered, owned by somebody, in the ground. No new well required, right? The well is already there.

Mr. McELWRATH. That's right.

Senator DOMENICI. We're throwing it away. I can't understand why it takes us so long to just put a pencil to the dollars and cents and say what's wrong with $100 million incentive if it picks that up?

And I would, Mr. Chairman, for this record like to put in S. 828, which you are a cosponsor of. This is a minor incentive for enhanced recovery that we are told in a state like New Mexico will put 8,000 people back to work by the turn of the century and add 50 percent to our recoverable reserves with one little incentive that, frankly, the numbers are startling.

The joint tax group says $50 million a year is what it costs in tax incentives. I want to say for the record I think they're wrong. I think it's higher. But that's what we use. I mean I cannot understand why we would spend 600 million to put money in the petroleum reserve and not spend 50 million so that we could get oil that we already own out of the ground.

I assume those kinds of things will be looked at as part of this energy policy?

[The text of S. 828 follows:]

II

101ST CONGRESS
1ST SESSION

S. 828

To amend the Internal Revenue Code of 1986 to provide incentives for the removal of crude oil and natural gas through enhanced oil recovery techniques so as to add as much as 10 billion barrels to the United States reserve base, to extend the production of certain stripper oil and gas wells, and for other purposes.

IN THE SENATE OF THE UNITED STATES

APRIL 18 (legislative day, JANUARY 3), 1989

Mr. DOMENICI (for himself, Mr. BOREN, Mr. DOLE, Mr. NICKLES, Mr. WALLOP, Mr. GARN, Mr. BINGAMAN, Mr. JOHNSTON, Mr. MCCLURE, and Mr. GRAMM) introduced the following bill; which was read twice and referred to the Committee on Finance

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A BILL

To amend the Internal Revenue Code of 1986 to provide incentives for the removal of crude oil and natural gas through enhanced oil recovery techniques so as to add as much as 10 billion barrels to the United States reserve base, to extend the production of certain stripper oil and gas wells, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. SHORT TITLE; TABLE OF CONTENTS.

(a) SHORT TITLE.—This Act may be cited as the "Enhanced Oil and Gas Recovery Tax Act of 1989".

(b) TABLE OF CONTENTS.—

Sec. 1. Short title; table of contents.
Sec. 2. Enhanced oil and gas recovery depletion allowance.
Sec. 3. Alternative minimum tax provisions.
Sec. 4. Research and development credit.

SEC. 2. ENHANCED OIL AND GAS RECOVERY DEPLETION ALLOWANCE.

(a) IN GENERAL.—Section 613A of the Internal Revenue Code of 1986 (relating to limitations on percentage depletion in case of oil and gas wells) is amended by redesignating subsection (e) as subsection (f) and by inserting after subsection (d) the following new subsection:

"(e) OIL AND GAS RECOVERED THROUGH ENHANCED RECOVERY TECHNIQUES.—

"(1) IN GENERAL.—In the case of so much of the taxpayer's production of domestic crude oil or natural gas during the enhanced recovery period which is incremental tertiary oil or incremental tertiary gas—

"(A) the allowance for depletion shall be computed in accordance with section 613, and

"(B) for purposes of section 613(a), the percentage determined under paragraph (2) shall be deemed to be the percentage specified under section 613(b).

"(2) ENHANCED OIL RECOVERY DEPLETION PERCENTAGE.—

"(A) IN GENERAL.—The percentage determined under this paragraph shall be 27.5 percent.

"(B) PHASE-OUT AS OIL PRICES INCREASE.—In the case of production during any calendar year, if the average annual removal price during the calendar year exceeds $30, the percentage under subparagraph (A) shall be reduced (but not below 15 percent) by 1 percentage point for each dollar of such excess.

"(C) AVERAGE ANNUAL REMOVAL PRICE.—For purposes of subparagraph (B), the average annual removal price for any calendar year shall be determined by dividing the taxpayer's aggregate production of domestic crude oil during the calendar year by the aggregate amount for which such domestic crude oil was sold (determined after application of paragraphs (2), (3), and (4)) of section 4988(c) by the taxpayer.

"(D) INFLATION ADJUSTMENT.—In the case of any calendar year after 1990, the $30 amount under subparagraph (B) shall be adjusted by multiplying such amount by the inflation adjustment factor for such calendar year determined under section 29(d)(2)(B) by substituting '1989' for '1979'.

"(E) NATURAL GAS.—The percentage under this paragraph with respect to incremental natural gas shall be determined in the same manner as for incremental tertiary oil.

"(3) INCREMENTAL TERTIARY OIL OR GAS.—For purposes of this subsection—

"(A) INCREMENTAL TERTIARY OIL.—The term 'incremental tertiary oil' has the meaning given such term by section 4993, except that—

"(i) the date of the enactment of this paragraph shall be substituted for each of the following:

"(I) March 31, 1979 in section 4993(b)(1),

"(II) 1978 in section 4993(b)(1)(A), and

"(III) May 1979 in section 4993(c)(2)(B),

"(ii) reservoir improvements (including infill patterns and pattern conformance) shall be treated as part of a project which is otherwise a qualified tertiary recovery project,

"(iii) nonhydrocarbon gas flooding, tight formation gas as defined in section 107(c)(3), (4) and (5) of the Natural Gas Policy

Act, and tight formation oil with a 5 millidarces permeability standard shall be treated as meeting the requirements of section 4993(c)(2)(A), and

"(iv) any expansion (either horizontally or vertically) after the date of the enactment of this paragraph of a project begun on or before such date shall be treated as a separate project.

"(B) INCREMENTAL TERTIARY GAS.—The determination as to whether domestic natural gas is incremental tertiary gas shall be made in a manner similar to the manner as the determination whether domestic crude oil is incremental tertiary oil is made. For purposes of the preceding sentence, directional drilling in a tight sands formation shall be treated as meeting the requirements of section 4993(c)(2)(A).

"(4) ENHANCED RECOVERY PERIOD.—For purposes of this subsection—

"(A) IN GENERAL.—The Secretary shall publish a schedule of enhanced recovery periods for projects which—

"(i) is based on the average period which is required for a project to recover the

expenses of the type of qualified tertiary recovery project involved, and

"(ii) takes into account regional differences.

"(B) TRANSITION RULE.—An enhanced recovery period shall not end before the later of—

"(i) the date which is 6 months after the publication of the schedule under subparagraph (A), or

"(ii) the date specified in the schedule.

"(5) SPECIAL RULE FOR EXISTING PROJECTS.—In the case of a project the beginning date for which begins on or before the date of the enactment of this paragraph—

"(A) oil or gas produced after such date of enactment which (but for the project beginning date) would be treated as incremental tertiary oil or gas shall be so treated solely for purposes of this subsection, and

"(B) paragraph (2)(A) shall be applied by substituting '18 percent' for '27.5 percent'.

"(6) OTHER RULES.—For purposes of this subsection—

"(A) COORDINATION WITH OTHER PROVISIONS.—Unless the taxpayer elects not to have

this subsection apply to incremental tertiary oil or gas, such oil and gas shall not be taken into account in computing the taxpayer's depletable oil quantity under subsection (c).

"(B) REFERENCES.—Any reference to a section of chapter 45 (relating to windfall profit tax on crude oil) shall be a reference to such section as in effect before its repeal.

"(7) TERMINATION.—This subsection shall not apply to production after December 31, 2009, except that in the case of production after December 31, 1999, and before January 1, 2010, this subsection shall apply only to production from projects the beginning date for which is before January 1, 2000.".

(b) NET INCOME LIMITATION ON PERCENTAGE DEPLETION NOT TO APPLY.—Section 613(a) of the Internal Revenue Code of 1986 (relating to percentage depletion) is amended—

(1) by striking out "(a) GENERAL RULE.—" and inserting:

"(a) PERCENTAGE DEPLETION ALLOWED.—

"(1) IN GENERAL.—", and

(2) by adding at the end thereof the following new paragraph:

"(2) SPECIAL RULES FOR INCREMENTAL TERTIARY OIL AND GAS.—In the case of any property from which incremental tertiary oil or gas to which section 613A(e) applies is produced—

"(A) paragraph (1) shall be applied separately with respect to such oil or gas and other production from such property,

"(B) income and deductions shall be allocated (for purposes of paragraph (1) and section 613A(c)(7) (A) or (B)) to such production in proportion to the gross income during the taxable year from such production, and

"(C) the second sentence of paragraph (1) shall be applied with respect to the incremental tertiary oil or gas by substituting '100 percent' for '50 percent'."

(c) EFFECTIVE DATE.—The amendments made by this section shall apply to production after the date of the enactment of this Act.

SEC. 3. ALTERNATIVE MINIMUM TAX PROVISIONS.

(a) IN GENERAL.—Section 57 of the Internal Revenue Code of 1986 (relating to items of tax preference) is amended by adding at the end thereof the following new subsection:

"(c) SPECIAL RULES FOR OIL AND GAS REMOVED THROUGH ENHANCED RECOVERY TECHNIQUES.—

"(1) IN GENERAL.—If the average annual removal price for the calendar year in which the taxable year begins is less than $30, paragraphs (1) and (2) of subsection (a) shall not apply to—

"(A) the deduction for depletion for incremental tertiary oil or gas determined under section 613A(e), or

"(B) any intangible drilling costs properly allocable to incremental tertiary oil or gas.

"(2) ALLOCATION RULES.—No amounts properly allocable to incremental tertiary oil or gas shall be taken into account under paragraphs (1) and (2) under subsection (a) in determining any deduction for depletion, adjusted basis, excess intangible drilling costs, or net income.

"(3) AVERAGE REMOVAL PRICE.—For purposes of this subsection—

"(A) IN GENERAL.—The term 'average annual removal price' has the meaning given such term by section 613A(e)(2)(C).

"(B) INFLATION ADJUSTMENT.—The $30 amount under paragraph (1) shall be adjusted in the same manner as provided in section 613A(e)(2)(D).

"(4) TERMINATION.—This subsection shall not apply to production, or costs paid or incurred, after December 31, 2009, except that this subsection shall apply to production, or costs paid or incurred, after December 31, 1999, and before January 1, 2010, only with respect to projects the beginning date for which is before January 1, 2000."

(b) EFFECTIVE DATE.—The amendment made by this section shall apply to production, or costs paid or incurred, after the date of the enactment of this Act.

SEC. 4. RESEARCH AND DEVELOPMENT CREDIT.

(a) IN GENERAL.—Section 41 of the Internal Revenue Code of 1986 (relating to research and development credit) is amended by adding at the end thereof the following new subsection:

"(j) SPECIAL RULES FOR RESEARCH RELATING TO OIL AND GAS TERTIARY RECOVERY PROJECTS.—For purposes of this section—

"(1) any research to discover or improve (in accordance with sound engineering principles) 1 or more tertiary recovery methods for domestic crude oil or natural gas shall be treated as qualified research,

"(2) this section shall be applied separately with respect to such research (including the computation of separate base period research expenses), and

"(3) subsection (a)(1) shall be applied by substituting '10 percent' for '20 percent'."

(b) EFFECTIVE DATE.—The amendment made by this section shall apply to amounts paid or incurred after the date of the enactment of this Act and before January 1, 2010, except that amounts paid or incurred before such date shall be taken into account for determining base period research expenses.

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Mr. MCELWRATH. Without question, Senator. I think that there is certainly a recognition that we need to look at the cost-effectiveness of our programs, our federal programs, across the board. I think we are going to be looking very closely at the trade-offs involved.

Some would tell you we should increase the Strategic Petroleum Reserve size now, with prices being what they are, if we anticipate an increase in prices in the future. Others would argue, and I think quite effectively, that the domestic resource remaining in the ground is important to us and most importantly because of that abandonment rate. We're not going to have the luxury of second-guessing ourselves a few years from now and saying, well, we should have produced that incremental oil, because it will be foreclosed to us economically.

I do believe that S. 828, your bill, the bill supported by Senator Bingaman, would be an effective bill, without question, for increasing production in this country. I think while obviously the Department of Energy supports the tax proposals that have been outlined in the president's budget, I can say definitively that we do believe that alternative proposals like S. 828 should be carefully, carefully explored and looked at.

We like a lot of the provisions of that legislation, and that type of consideration, really for the longer term, will be something that we're looking at intensively in the NES.

Senator DOMENICI. My last question has to do with tax incentives again. Frankly, I want to state for the record and for the New Mexico friends who are here, I hope you don't assume that because I'm focusing on something very targeted, that I don't understand that America's energy policy is a very complicated thing. I mean it does not just involve these few things we are speaking of.

I mean it involves what's going to happen to nuclear energy. It involves what we're going to do to use our own reserves offshore, if ever. It involves whether we're ever going to find out what's in ANWR or not. It involves a lot of other things. It involves technology to try to find automobile engines that are cleaner, use alternative fuels. Those are all big-ticket items.

But it seems absolutely ludicrous to me not to look at oil and gas production just on a pure cost-effective basis unless, unless we just assume that there is no negative impact to growing dependence and sending our money to foreign countries in increased billions of dollars every year. If those are irrelevant to America's future, then obviously what we're talking about short term here is probably rather insignificant.

I happen to think they're pretty serious, and I assume that these short-term problems of growing dependence and dependence on oil and gas, the department's fully aware that that scenario is not going to change much. Is that right?

Mr. MCELWRATH. That's true.

Senator DOMENICI. And we're going to keep sending lots of money to foreigners, more each year, unless we produce some of our own, as difficult as it is to produce.

Mr. MCELWRATH. That's right. It's already at an alarmingly high level, and probably the best we can do is try to maintain that level and not see too much of an increase. But without some sort of

action, we'll have an inexorable trend towards higher and higher imports.

Senator DOMENICI. Lastly, Senator Bingaman is right on when he says we really don't need out of this department—because they're gaining in credibility—we don't need a policy that is not supported by budgets. We don't need you saying you're going to spend a lot more money in fossil research short-term and then send a budget up that's got only a little tiny increment increase.

You're not the man that does it, but this budget this year does not quite speak with the same dollars as the rhetoric. And I think it's very important that you make those mesh sooner or later or we can't get the money.

Thank you very much, Mr. Chairman.

Senator BINGAMAN. Thank you very much. Let me just call one other thing to Mr. McElwrath's attention here. This petroleum recovery research center at Socorro that Senator Domenici referred to, it's my information that they have a real concern about the level of DOE funding for some of the research that they are involved in with CO_2 flooding. And if you could look into that, we would appreciate it. We'll give you a copy of the correspondence we've received on that, and see if we couldn't maintain that program at a reasonable level.

Mr. MCELWRATH. We'll look into that.

Senator BINGAMAN. We appreciate it very much. And we appreciate all three panel members for their testimony.

Why don't we go to the second panel at this time, and on this panel we have Robert Bayless, Larry Bell, Darwin Van De Graaff and Don Walker.

Let's go ahead. I think we need to continue on here. We have several more witnesses after this panel and in order to get everybody's testimony in, I think we need to keep going. Let me just introduce the panel here and then we'll have testimony from each of them and have questions at the end, as we did before.

First Bob Bayless. Bob is representing the Independent Petroleum Association of New Mexico. He has been an independent oil and gas operator active in the San Juan Basin since 1957. We appreciate very much his presence here.

Larry Bell is the vice president for engineering and operations coordination for ARCO. He previously served as director of drilling operations for the company and was drilling superintendent for ARCO's Alaska operations.

Then Darwin Van De Graaff is a good friend of the industry. He has served as executive vice president of the New Mexico Oil and Gas Association since 1985. He has held similar positions in Montana, Utah and with the Rocky Mountain Oil and Gas Association.

And Don Walker is the regional drilling manager for Meridian Oil in the San Juan Basin. Don has been involved in this development, oil and gas development, since 1964. So why don't we go ahead and hear from you. Just go down the table this way. Bob, why don't you start.

STATEMENT OF ROBERT L. BAYLESS, INDEPENDENT PETROLEUM ASSOCIATION OF NEW MEXICO

Mr. BAYLESS. Thank you, Mr. Chairman, Senator Domenici. My name is Robert L. Bayless. I'm an independent producer from Farmington. I appreciate the opportunity to appear here before the committee. You're addressing a very important segment of the producing industry, which has received little attention during the years of discussing, quote, our energy problem, and that is the work force that goes into producing our energy.

At a seminar yesterday, the subject of oil and gas prices arose and their relationship to oil field employment. I think it's important to remember that the most sophisticated of training programs for oil field workers is of small value unless you have a stable employment environment. To fully grasp the lack of an employment stability and the basic causes thereof, one should review the natural gas industry for the past 40 years.

The natural gas industry was price regulated and controlled by Congress in the early 1950's. This resulted in a gradual reduction of drilling until the exploratory and development industry was practically dead. All of this resulted in increasing shortage of natural gas.

And in attempt to remedy this, in 1978 the NGPA was enacted. This dramatically increased the price available for newly developed natural gas and from gas below 15,000 feet. The result of this legislation was to create a drilling boom with oil field employment greater than anything previously seen.

Four years later, 1982, it was perceived a substantial amount of natural gas reserves had been developed and the drilling boom died and a basic reshaping of the industry started resulting in a great reduction of oil field personnel. This situation was aggravated by abrupt actions of FERC in canceling purchase contracts between pipeline transmission companies and distribution companies. The suddenness and lack of anticipation of the ultimate ramifications of this regulatory procedure still have the natural gas industry in a turmoil. It appears there is really no remedy nor end in sight.

The regulatory actions and problems so created have been aggravated by conflicts between the regulatory agency and the federal court system. The net result of the above actions is that natural gas reserves are steadily dropping now and the, quote, gas bubble of recent years appears to be now heading toward another shortage in the future.

New Mexico has been a fortunate exception to this reduction of reserves because of the coal methane tax credit, which has resulted in a lot of drilling being done in New Mexico in the last two years. This drilling activity will dwindle appreciably by the end of 1990 unless Congress extends this period of tax credit.

Unfortunately for New Mexico, this tax credit and the drilling activity created thereof is not available to independent producers, because of the overriding alternative minimum tax. So, as you can see, there are many conflicts in the various rules, regulations and laws we have and their offsets.

Our current national situation serves to demonstrate that the natural gas industry has been absolutely subject to short-term

thinking of legislative, regulatory, judicial systems, and the significant thing is the end result is a widely swinging, erratic labor market for personnel to work in the energy producing field.

In addition to price stability, incentives for enhanced oil recovery techniques should be examined closely. These two items can have a very substantial effect on reversing the nation's heavy dependence on imported oil. These actions could generate sufficient activity that the bulk of personnel training in this country for the energy field will be funded by the private sector.

In the absence of stable wellhead prices, there is an even bigger problem, which is cyclical employment/unemployment swings. What happens to the trained workers in periods of prolonged inactivity because of low prices? We've heard testimony about future shortage of workers, much less well-trained workers. These workers will either have to be subsidized in periods of inactivity or new workers will have to be trained during the up cycles. This is really very inefficient. Socially it's not a good program to have the wide swings of employment.

Unless the United States—unless our culture, our society—seriously addresses the wellhead price stability, we are not going to have a stable labor force in this country to produce our domestic crude oil and natural gas. In an environment of reasonable and stable prices, the nation has the components for training a competent work force. We have the means of doing remedial training or on-job training. We have the facilities in the state of New Mexico to do this that are not nearly fully utilized over a prolonged period.

I would recommend that existing oil field institutions be utilized on regional or national basis. The Federal Job Training Partnership Act has flexibility that can address these needs for the industry.

And I think we need to keep in mind that the most important ingredient is the worker. We've heard during this meeting that the work force is shrinking. I suggest that action for wellhead price stabilization be undertaken soon. We do not have the luxury of time on our side and we should not expose the nation, our nation, to being held hostage to oil producing countries in the form of unreasonably high fuel prices or actual physical shortages because our labor force is unable to perform and because we have not taken care of our labor force.

Thank you. I would like to apologize. I prepared this before some of the comments were made today, so I'm being redundant in what you've already said.

Senator BINGAMAN. That's quite all right. We have a lot of redundancy around the Congress. [Laughter.]

We're glad to have a little more of it. But we appreciate those comments. Mr. Bell, why don't you go right ahead.

STATEMENT OF L.N. BELL, VICE PRESIDENT, ENGINEERING AND OPERATIONS COORDINATION, ARCO OIL AND GAS CO.

Mr. BELL. Senators, thank you for the opportunity of being here today, and I'll accelerate my remarks a little as I believe we're a little behind time.

I'd like to add a little perspective, perhaps, on the level of industry activity we've seen over the years. I'd like to go back to the years—really the end of World War II, and remember that we grew very rapidly and for about ten years after that war to what seemed to be a very high level of activity in 1957, which I believe was our peak, at about 2,750 rigs running in the U.S. Remember, at that time, of course, the price of oil was in the $2.50-$3.00-a-barrel range.

Industry economics changed in the late 1950's. Our activity level declined drastically at that time, somewhat in the same percentage that we have seen in this go-round, finally falling to a stable, quasi-stable level, perhaps, as reserves were declining during that period in the late 1960's down to about a 1,000-rig level, and ran along at pretty much that level for about five years.

Senator DOMENICI. Down to what, sir?

Mr. BELL. Down to about a 1,000-rig level. Actually the minimum was 976 rigs in 1971. In 1973 the world changed again with the oil embargo of that year. Price moved up a bit and rig count moved up along with it. To the middle to late 1970's, we were looking at about 1,700, 1,800 rigs running in the U.S. Oil prices were in the $11 and $12-a-barrel range in the dollars of that day.

In 1979, of course, the Shah of Iran went down, the price moved up, the boom was on for the oil to actual prices in the $35-a-barrel range, perceived prices in the near future much, much higher than that. Of course, that didn't happen, as we know. We only had two or three years of real boom at those kinds of prices.

And in 1982 the industry activity went away for much of the service and supply industry, and went away for the entire domestic industry in 1986, as oil prices declined drastically again. 1986, 1987, 1988 and 1989 were all down years. Industry activity continued to decline during that period.

I think the question we would have now: Is 1990 an up year? Are we seeing the beginning of resurgence? Or are we simply in another quasi-stable period in which supply and demand are perceived to be in fair balance?

I'll note that activity in the U.S. today is about what it was 20 years ago. Our work force involved in that activity is much larger. We're somewhere around—I think the previous gentleman from New Mexico labor here noted somewhere around 470,000 people today. We only had about 275,000 in the early 1970's. So at the same level of activity, much larger work force and, of course, there are some good reasons for that.

However, what the industry, I believe, is going to have to have to maintain anything like the level we are at, much less improve, is some kind of assurance as to what the future may hold. Perhaps the most important part of that, if you think of energy policy in very fundamental ways, we need a policy that provides some fairly stable picture of our future. Perhaps the most telling item that we don't have any assurance of right now in the industry is access. And Senator, you mentioned the OCS——

Senator DOMENICI. Is what?

Mr. BELL. Access to new areas around the U.S., in the outer continental shelf and ANWR. Really there is no access in the U.S. now that we can see to new areas except for remaining areas of the

Gulf of Mexico, primarily in deep water. I think that's the biggest shortfall that we have in where our industry is going domestically. And, of course, that lack of assurance is driving a great deal of major company investment money out of the U.S.

Of course, along with the access issues, we need the regulatory setting that provides the opportunity to invest in that access, again, with some assurance of a future, and to invest in ongoing operating areas as well to give us the opportunity to recover more of our known reserves.

So I think the issue is really one of domestic policy—energy policy, if you like, although I think it's really broader than that—that provides us some assurance of being able to continue to invest in the U.S. industry at an equitable return.

And I believe I'll close my remarks right there and have your questions later.

Senator BINGAMAN. Thank you very much. Mr. Walker, why don't you go right ahead.

[The prepared statement of Mr. Bell follows:]

TESTIMONY OF L. N. BELL

ARCO OIL AND GAS COMPANY, DALLAS, TEXAS

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Subcommittee on Mineral Resources Development and Production

Committee on Energy and Natural Resources

United States Senate

Hearing on

The Future of The Domestic Oil and Gas Industry

The Performing Arts Center
Eastern New Mexico University
Roswell Campus
Roswell, New Mexico
April 11, 1990
9:00 a.m.

Chairman Bingaman, Senator Domenici, I am Larry Bell with ARCO Oil and Gas Company, Dallas, Texas. Thank you for this opportunity to appear before you today.

Regarding the current status and future of the domestic oil and gas industry, I believe it might be helpful to look at some history of industry activity levels to put the situation in perspective.

After the end of World War II, U.S. oil and gas exploration and production activity increased significantly. As measured by operating drilling rig count, the industry reached record levels of almost 2,600 rigs by 1951, and approximately maintained this level through 1956. Domestic oil prices during this period were relatively stable at about $2.50 to $3.00 per barrel. This high level of drilling activity resulted in discovery and development of significant oil and gas reserves and producing capacity. As the major producing states began to invoke stringent proration controls on production rates, drilling rig activity responded with a decline which lasted for the next ten years, even though U.S. oil prices held just below $3.00 throughout that period.

Activity was relatively stable at about 1,100 operating rigs during the period 1967 through 1972; oil prices were also stable at about $3.00 per barrel. Activity did not increase significantly until the Arab Oil Embargo began in late 1973. As U.S. oil producing capacity had peaked in 1970, U.S. oil prices now began to be driven by world oil prices. Activity responded to increased oil price; oil price was about $9.00 per barrel by 1978, and rig count was up to about 2,300 rigs, or an increase of about 13% per year over six years.

In 1979, the Shah of Iran was deposed; world oil prices spiralled upward, and a worldwide drilling boom was underway. U.S. operating rig count moved upward to an all-time high of 4,500 rigs by late 1981; an average increase of about 35% per year over three years.

This short-lived boom was driven by high ~~oil~~ prices and a perception of even higher future prices. Oil prices softened in mid-1981; a precipitous activity decline began at the end of that year. By late 1982, rig count had fallen to about 2,500 rigs, or a 45% decline in less than one year. This drastic drop in activity dealt a heavy blow to the oil service, supply, and contracting infrastructure. For the next three years, activity cycled in the 2,000 - 2,400 rig range with U.S. oil prices at about $26 a barrel.

In early 1986, the other shoe dropped. Saudia Arabia declined to continue its role as the worldwide swing producer and increased its oil production rate. The world oil price dropped precipitously, and U.S. activity levels followed suit. Since that time, U.S. rig count has averaged about 950 rigs. It appears that 1990 will be only slightly higher than that level.

In short, U.S. activity is relatively flat at about the same level that existed through the last half of the 1960s and early 1970s. Therefore, it is far from clear that we are into a strong recovery period, although some improvement may be occurring.

In any case, although an appropriately strong oil and gas infrastructure and U.S. labor force is important, another issue overrides that concern. Are the jobs going to be there for the longer term?

The real need is for a U.S. energy policy that provides certain items: access to new areas for exploration in the U.S. (such as ANWR and OCS), and the opportunity to invest in those areas (as well as existing producing areas) under fair and consistent regulatory controls.

A significant portion of potential investment in U.S. exploration and production appears to be going, instead, into international operations. Opportunities to invest in the U.S. would provide more jobs as well as secure energy for our country.

Thank you for the opportunity to appear before this subcommittee.

STATEMENT OF DONALD WALKER, REGIONAL DRILLING MANAGER, MERIDIAN OIL CO.

Mr. WALKER. Thank you. Mr. Chairman, Senator Domenici, members of the panel, attendees of the subcommittee hearing, I've been involved in oil and gas development in the San Juan Basin since 1964, and during that time I've experienced the boom and bust cycles that seem to plague our industry. If there is one thing I'd like to stress in my testimony, it is the fact that now, more than ever, industry programs need to be initiated that will smooth out the roller-coaster ride the operating companies and service industries have taken in the past.

The oil companies and service industry need to emphasize hiring practices and training programs which stabilize personnel requirements. The down cycles severely damage the infrastructure at the very time when a healthy industry with the ability to respond to change is most needed.

Higher-than-average wages on drilling rigs during the 1960's and 1970's allowed labor to survive even when the rigs were down part of the time. But wages started decreasing in the 1980's after the oil price fell and only recently have climbed back to the 1981 level. In real dollars, they have not reached the 1981 level even yet, but are 30 percent to 40 percent under the 1981 level.

In 1981 at the peak of the boom there were 4,500 active drilling rigs in the fleet. Today there are about 2,500 rigs available with less than 1,000 making a hole. If the rest of the country is similar to the San Juan Basin, most of the remainder of the rigs in the fleet will be unable to start drilling due to lack of labor.

A 1,000-rig fleet will requires about 25,000 hands to operate. An increase to 2,500 operating rigs would require about 62,000 hands.

The work force that was trained in the early 1980's is no longer in place. The down cycles have driven trained industry workers into other lines of work never to return. Down cycles in the San Juan Basin have resulted in substantial reduction in the experienced work force as ex-employees have been forced to move to other industries in other areas of the country to make a living.

We are seeing industry turnaround in the San Juan Basin, but we're also seeing the effects of limited labor force. At least 20 percent of available rigs in the basin were not able to mobilize last year because contractors could not find people to man them. Forecasts for 1990 indicate this problem will only get worse.

Operating companies, such as Meridian, can increase the work load on their staffs during industry upswings but service industries aren't successful in increasing its work load. One truck driver cannot drive two trucks. One equipment operator cannot operate two cement pump trucks. Two roughnecks cannot make four. Although some technological and training advances have been made, the competitive nature and economics of business currently do not allow additional manpower reductions.

What can the industry do to become viable and healthy after one of the biggest boom/bust cycles ever? Starting point is developing consistent manpower treatment within the domestic industry and adopting programs that will better utilize and train personnel to help prevent rather than foster the up-and-down cycles that oil

field workers have gone through over the past two decades. A less cyclic industry would be perceived as a better employer with the resulting trained labor pool ready and willing to once again work in the industry.

There is a final issue that I would like to address. The oil and gas industry is perhaps the most regulated around. The alphabet soup of regulatory agencies all have their oversight responsibilities, which at times makes it a maddening experience to attempt to find and develop domestic reserves. With all these agencies involved, it is critical that a clear overall directive be formulated which allows the industry to operate under reasonable regulatory rules.

The industry recognizes our responsibilities and realizes we are accountable for our actions. At the same time, it is my hope that federal and state agencies also try to correct those policies and regulations that frustrate development and serve no real purpose.

Accountability should be stressed to federal and state agencies so that domestic development is fostered while, at the same time, tending to concerns of safety, environment and cultural resources. With so much publicity over the past year concerning oil spills, just imagine what our sealanes, harbors and ports will be like in the year 2000 if domestic production continues to decline while our national consumption increases.

In closing, it is Meridian's position that the industry will be able to meet these challenges just like we have in the past. A strong domestic industry is critically important in meeting these challenges. By reducing the cyclic swings in the business, the industry will be perceived as a better employer and shortly a number of our problems will disappear.

Thank you.

[The prepared statement of Mr. Walker follows:]

STATEMENT OF DONALD WALKER
Meridian Oil Inc.

Senators Bingaman and Domenici, members of the panel and other attendees at this Subcommittee hearing: My name is Don Walker, and I am Regional Drilling Manager for Meridian Oil in the San Juan Basin of New Mexico and Colorado.

I have been asked to testify about the needs of the oil and gas industry for the 1990's and to give a perspective from the San Juan Basin on the future needs for personnel training and labor supply.

I have been involved in oil and gas development in the Basin since 1964 and during that time have experienced the boom and bust cycles that seem to plague our industry. If there is one thing I would like to stress in my testimony, it is the fact that now more than ever, industry programs need to be initiated that will smooth out the rollercoaster ride the operating companies and service industry have taken in the past. The oil companies and service industry need to emphasize hiring practices and training programs which stabilize personnel requirements. The down cycles severely damage the infrastructure at the very time when a healthy industry with the ability to respond to changes is most needed.

Higher than average wages on drilling rigs during the 60's and 70's allowed labor to survive even when the rigs were down part of the time. But, wages started decreasing in the 80's after the oil price fell and only recently have climbed back to the 1981 level. In real dollars, they have not reached the 1981 level even yet, but are 30% to 40% under the 1981 level.

In 1981 at the peak of the boom, there were 4500 active drilling rigs in the fleet. Today there are about 2500 rigs available with less than 1000 making hole. If the rest of the country is similar to the San Juan Basin, most of the remainder of the rigs in the fleet will be unable to start drilling due to lack of labor. A 1000 rig fleet requires about 25,000 hands to operate. An increase to 2500 operating rigs would require about 62,000 hands.

The work force that was trained in the early eighties is no longer in place.

Down cycles have driven trained industry workers into other lines of work --- never to return!

Down cycles in the San Juan Basin have resulted in a substantial reduction in the experienced work force as ex-employees have been forced to move to other industries and other areas of the country to make a living.

We are seeing an industry turn around in the San Juan Basin, but we are also seeing the effects of a limited labor force. At least 20% of the available rigs in the basin were not able to mobilize last year because contractors could not find people to man them. Forecasts for 1990 indicate this problem will only get worse.

Operating companies such as Meridian can increase the work load on their staffs during industry upswings. But, the service industry is not as successful in increasing its workload. One truck driver cannot drive two trucks. One equipment operator cannot operate two cement pump trucks. Two roughnecks cannot make four. Although some technological and training advances have been made, the competitive nature and economics of the business currently do not allow additional manpower reductions.

What can the industry do to become viable and healthy after one of the biggest boom/bust cycles ever? A starting point is developing consistent manpower treatment within the domestic industry --- and adopting programs that will better utilize and train personnel to help prevent rather than foster the up/down cycles that oilfield workers have gone through over the past two decades.

A less cyclic industry should be perceived as a better employer with a resulting trained labor pool ready and willing to once again work in the industry.

There is a final issue which I would like to address. The oil and gas industry is perhaps the most regulated around. The alphabet soup of regulatory agencies all have their oversight responsibilities which at times makes it a maddening experience to attempt to find and develop domestic reserves. With all these agencies involved, it is critical that a clear overall directive be formulated which allows the industry to operate under reasonable regulatory rules.

The industry recognizes our responsibilities and realizes we are accountable for our actions. At the same time, it is my hope that federal and state agencies also try to correct those policies and regulations that frustrate development and serve no real purpose. Accountability should be stressed to federal and state agencies so that domestic development is fostered while at the same time tending to the concerns of safety, environment and cultural resources.

With so much publicity over the past year concerning oil spills, just imagine what our sea lanes, harbors, and ports will be like in the year 2000 if domestic production continues to decline while our national consumption increases.

In closing, it is Meridian's position that the industry will be able to meet these challenges just like we have in the past. A strong domestic industry is critically important in meeting these challenges. By reducing the cyclic swings in the business, the oil industry will be perceived as a better employer, and the short-term labor problems will disappear.

Senator BINGAMAN. Thank you very much. Van, why don't you pull that microphone up and go ahead with your testimony.

STATEMENT OF DARWIN VAN DE GRAAFF, EXECUTIVE VICE PRESIDENT, NEW MEXICO OIL & GAS ASSOCIATION

Mr. VAN DE GRAAFF. Thank you, Mr. Chairman, and Senator Domenici. I appreciate the opportunity to be here today, and I would like to especially acknowledge the cooperation of your staff in making these arrangements and including us in both the formal and informal activities related to this field hearing.

There is good news and there is bad news. The good news is that we in the oil industry feel that right now, today, is the best opportunity we're going to have to find and develop domestic oil and gas reserves. The bad news is that we in the oil industry believe that today, right now, is the best opportunity we're going to have to find domestic oil and gas reserves.

It doesn't look like things are going to get better. There are fewer government regulations and controls today than there will be tomorrow. There are fewer restrictions on access to public lands today than there will be tomorrow. The cost of drilling is going to be less today than we expect it will be tomorrow. And we see that we will be more dependent on the whims of foreign oil cartels in the future than we are today. By this criteria, today is the best day of the rest of our lives.

We sincerely believe that the domestic oil and gas industry has great potential. We also believe that the wildcatting spirit that has served both our industry and our country so well in the past is being smothered by short-sighted and unwise policy.

In the interest of time I will leave the global arguments to others and mention only three broad issues that, while national in scope, could have effect on the oil patch here in New Mexico. First, I would suggest that a national energy policy include the requirement that an energy impact statement be developed for consideration when relative laws are promulgated. Tax proposals require fiscal impact statements. A variety of laws require environmental impact statements.

It seems appropriate that at both state and federal levels, then, that when laws are passed which impact energy development, those passing such laws should have the benefit of knowing full effect of their action. This may not change a law, but it should help to insure better informed rules and regulations. Perhaps a better balance can be achieved if our side of the balance sheet gets full consideration.

Secondly, I would suggest that there needs to be a better program for educating lawmakers and the public and the structure and complexities of the energy industry. Even some of our friends appear to have what can be called a controlled schizophrenia. On the one side, they recognize the need for development of our energy industries, but on the other side, they choose to totally ignore the impact that can be realized from government intrusion into the consumer marketplace.

Quick fixes of product preferences, supply or price that temporarily satisfy a particular consumer group at the gasoline pump or at

the burner tip are, in all probability, not in the best interest of our industry, nor do they contribute to the long-term energy security of our country. Whatever prices are, they should be sufficient to replace reserves, and unless it has been understood that retail prices and consumer rates directly affect the ability to discover and develop reserves, this country will unfortunately run out of reserves.

I would like to point out parenthetically that of all the problems the oil industry has ever had in the past 20 years, none has caused as much concern as the absence of supply. Oil spills, prices, monopolies, profits will not replace all the charges, real or imaginary, that were lodged against the oil industry, none of them received the same attention in congress or in the public as did the long lines at the service stations or tractors stranded in the fields. Consumer policies that could lead to a return to that situation would be disastrous. And consumer policy affects upstream resource development.

And, finally, I suggest that government policy be broadened to include incentives or at least opportunities for increased engineering activities in the oil patch. Wildcatting will always be important. Traditional development will always be important. However, it is increasingly important that the ability to revisit existing fields to maximize production from known sources, that government policy should invite engineering creativity.

Secondary and tertiary projects need to be encouraged. The federal EOR bill, which we are pleased to compliment both of you gentlemen for your support, is a step in the right direction and an example of what I mean. But more can be done.

Why should I not get the same incentive for drilling horizontally into a new zone as I get for drilling deeper into a new zone? I believe new technology and engineering should receive increased encouragement from both state and federal governments.

The potential for a strong domestic oil and gas industry is there. In fact, it is here in New Mexico. We need wise, long-term policy commitments, and that is why we support the activities of this subcommittee. Thank you.

[The prepared statement of Mr. Van De Graaff follows:]

New Mexico Oil & Gas Association
P.O. Box 1864 □ Santa Fe, N.M. 87504-1864 □ Telephone 505/982-2568

April 11, 1990

Thank you Mr. Chairman.

My name is Darwin Van De Graaff. I am with the New Mexico Oil & Gas Association. We are a trade association representing oil and gas producers who are responsible for approximately 90% of the oil and gas which is produced in the state of New Mexico. Consequently, our members pay 90% of the production taxes and royalties collected by state and federal governments. We employ 90% of those men and women working in the petroleum extraction industry of our state, and we are 100% supportive of the efforts of this subcommittee to improve the viability of our domestic oil and gas industry.

We appreciate the opportunity to appear here today, and I would like to especially acknowledge the cooperation of your staff in making these arrangements and in including us in both the formal and informal activities associated with this field hearing.

There is the good news and there is the bad news.

The good news is that we in the oil and gas industry believe that today, right now, is the best opportunity we are going to have to find and develop domestic oil and gas reserves.

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It does not look as if things are going to get any better.

There are fewer government regulations and controls today than there will be tomorrow. There are fewer restrictions on access to public lands today then there will be tomorrow. The cost of drilling today is less than it is expected to be tomorrow, and we are less dependent on the the whims of the foreign oil cartel today than we will be tomorrow.

By this criteria, today is the best day of the rest of our lives.

We sincerely believe that the domestic oil and gas industry has great potential.

We also believe that the wildcatting spirit that has served both our industry and our country so well in the past is being smothered by shortsighted and unwise policy.

In the interest of time, I will leave the global arguments to others and mention only three issues that, while national in scope, could have noticeable effect on the oil patch here in New Mexico.

First, I would suggest that a national energy policy should include the requirement that an "energy impact" statement be developed for consideration when relative laws and regulations are promulgated.

Tax proposals require fiscal impact statements, and a variety of laws require environmental impact statements. It seems appropriate that when laws are passed which impact energy development that those passing such a law should have the benefit of knowing the full effect of their action. This may not change the law, but it should help assure better informed rules and regulations.

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they choose to totally ignore the impact that can be realized from government intrusion into the consumer market.

Quick fixes of supply or price that temporarily satisfy a particular consumer group at the gasoline pump or at the burner tip are in all probability not in the best interest of our industry. Nor do they contribute to the long term energy security of our country. Whatever prices are, they should be sufficient to replace reserves and unless it is better understood that retail prices and consumer rates directly effect the ability to discover and develop reserves, this country will unfortunately run out of reserves.

I would like to point out parenthetically that of all the problems the oil industry has had in the last twenty years, none has caused as much concern as the absence of supply. Oil spills, prices, profits, monopolies, all the charges, unfounded or not, that were directed toward our industry did not cause the same degree of reaction from Congress or the public as did lines at the service stations or tractors stranded in the fields. Consumer policies that would lead to a return of that situation would be disastrous. And, consumer policy affects upstream resource development.

Finally, I would like to suggest that government policy be broadened to include incentives or least opportunities for increased engineering activities in the oil patch. Wildcatting

will always be important. Traditional development will always be important.

However, what is increasingly important is the ability to revisit existing fields to maximize production from known sources -- government policy should invite engineering creativity.

Secondary and tertiary projects need to be encouraged. The federal EOR bill which we are pleased is supported by New Mexico's delegation is an example of what I mean. More could be done.

Why should I not get the same incentive for drilling horizontally into a new zone as I would if I drilled deeper into a new zone?

I believe new technology and engineering should receive increased encouragement from both state and federal governments.

The potential for a strong domestic oil and gas industry is there. In fact, it is here in New Mexico. We need wise long term policy commitments, and that is why we are 100% in support of the efforts of this subcommittee.

Thank you.

Senator BINGAMAN. Thank you very much. Mr. Bayless, let me ask you a question about this coal seam methane tax credit. If that is allowed to lapse and expire and is not extended, what do you anticipate will be the result as far as the level of activity in the San Juan Basin?

Mr. BAYLESS. I think you can find people with differing opinions. But my opinion is that the activity will severely drop, very severely.

Senator BINGAMAN. Assuming that we're able to continue that credit, how long a period of activity do you think we could look forward to?

Mr. BAYLESS. It seems to me that a two-year extension would do several things. It would probably smooth out the current boom effect that we're having in the San Juan Basin at this time. It would cause people to be able to spread out their drilling over that additional two years, and I think that would have a real wholesome effect. And, in addition, it will cause more wells to be drilled ultimately and more reserves.

Senator BINGAMAN. You think two years is better than something longer or shorter?

Mr. BAYLESS. Two years seems like a reasonable period of time.

Senator BINGAMAN. Let me ask, also, just from the perspective of an independent producer, to what extent is all of the research and development, which we were talking about with the earlier panel, to what extent is that really useful or relevant to an independent? And all this idea that we're developing new technologies and new techniques and all of that, is this something which independents are able to take advantage of in a serious way or do we need to do something differently to see that they could take some advantage of that?

Mr. BAYLESS. In natural gas production it does not seem that there has been that much research and development that has accomplished significant steps that I am aware of or I have been able to benefit by. The work that we've addressed earlier today has primarily been enhanced oil recovery, and I am not aware of large amounts of gas experimental research done.

GRI, Gas Research Institute, which is funded by producers through a tax, has done considerable work. I don't feel at this time I have reaped much benefit from that work. And I've attempted to.

Senator BINGAMAN. Let me ask Mr. Walker if he has any thoughts on this coal seam methane issue, or any of the other panelists who are involved, but Mr. Walker particularly, did you have thoughts about that based on your experience as to what the effect would be if we allow that tax credit to lapse?

Mr. WALKER. What Meridian's plans are right now, Senator, is we will probably develop the reserves which we have proven up in the future, but we probably won't go out and look for the less productive well, which we could with a tax credit.

Senator BINGAMAN. If the tax credit lapses, you would not go out and look for that less productive well. If it was extended, you would?

Mr. WALKER. If it were extended, we would. Right now we're in a situation where we've probably developed some of the better coal

seam areas with the tax credit, and we wouldn't go out without the tax credit and probably look for the less lucrative areas.

Senator BINGAMAN. Let me defer to Senator Domenici for questions he has.

Senator DOMENICI. I don't have very many. But let me just ask Mr. Walker, I think you mentioned the sea lanes, how much we would be using them by the year 2000 if we continue a policy of diminished production here and increased use. Does anybody, have you seen, or even you, Mr. Bell, seen anything that depicts that in terms of the number of average-size vessels that will be moving from foreign countries to some port in America in the year 2000 versus now?

Mr. BELL. I don't think I've seen a calculation, Senator, but I think it's almost a direct ratio. As our imported production goes up, those import tankers are going to go up just about at that ratio. So if you double the import, which would be nearly a hundred percent of what we will use, you'll double the tankers.

I don't see that the tankers are going to get larger. I think the day of any larger tankers than we use today is gone. So the numbers are more likely to increase rather than decrease in proportion.

Senator DOMENICI. Just an item for the record. It's really not necessarily relevant other than indirectly to the issue of access to things that are our own. Is it a statistic that the number of accidents of one type or another are directly proportional to the number of movements? We haven't changed that yet, have we? Isn't that kind of a realism?

Mr. BELL. You're referring to accidents in terms of transport vessels?

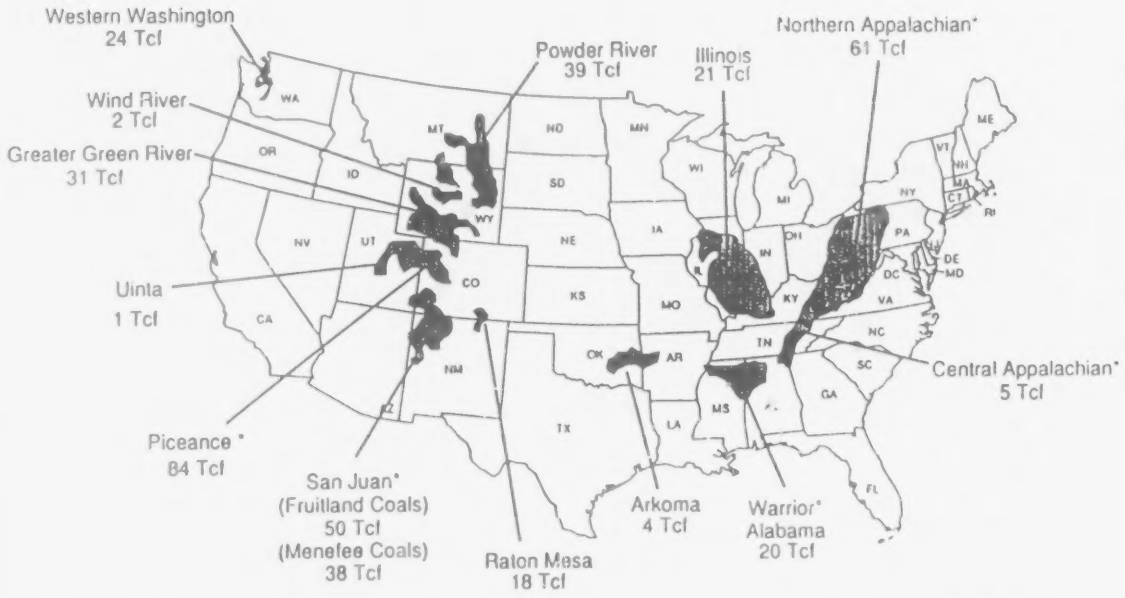
Senator DOMENICI. Yes. Just forget access for a minute. All I'm suggesting is we hear, and legitimately, great concern about accidents like the Valdez. I guess I'm asking if we don't have Alaskan oil but we have 40 percent more tankers moving from somewhere in the world to somewhere in the United States, is it not still a given that there will be more accidents rather than less, with 40 percent more tankers moving into various positions of having to deliver in the United States?

Mr. BELL. Yes, sir, I believe that's certainly true. There is another factor there. Let's say that if there were no Alaskan tankers at the moment. Remember that those are U.S.-flagged tankers. Oil brought in from all over the world will not be brought in on U.S.-flagged tankers, which we, obviously, have less control.

Senator DOMENICI. Let me ask both of the witnesses that spoke of the coal bed methane resources and let me, Mr. Chairman, with your permission, for the record, put in the record a ICF Resource, Incorporated assessment of the coal bed methane resources of the United States. Perhaps you have seen it, Jeff, but it was startling to me.

[The map follows:]

Coalbed Methane Resources of the U.S.



*Detailed Geologic Appraisals Completed by GRI/ICF Lewin

Total Resource ≅ 400 Tcf

Senator DOMENICI. How much natural gas do we use a year in the United States? Do we have a number?

Mr. BELL. About 17 trillion cubic feet.

Senator DOMENICI. So if we said 20, the estimate is that just this resource is 400 trillion cubic feet—certainly not ours, not up there in Four Corners, but in the six areas—just do the arithmetic, that's quite a number of years of total American supply from just it.

And I assume you were suggesting that if we don't extend the tax credit, we are not apt to get development sufficient to turn some of these difficult areas into reserves. Is that kind of what I'm hearing?

Mr. BAYLESS. My comment would be that what precipitated this drilling was the tax credit, and if the tax credit leaves, it will kill the drilling.

Senator DOMENICI. I would like, then, again to put in the record another bill, Senate Bill 2288, which you're cosponsor of, Senator Bingaman, and it extends that credit for two years. But it also addresses the issue of nonconventional fuels, including tight sands, which are under attack by the Federal Energy Regulatory Commission. I assume you people who are aware of natural gas in New Mexico support both of those?

[The text of S. 2288 follows:]

II

101ST CONGRESS
2D SESSION

S. 2288

To amend the Internal Revenue Code of 1986 to extend for 2 years the application of credits for qualified nonconventional fuels, to equalize the treatment of tight formation natural gas, and to restore tax credits denied by operation of decisions by the Federal Energy Regulatory Commission.

IN THE SENATE OF THE UNITED STATES

MARCH 9 (legislative day, JANUARY 23), 1990

Mr. DOMENICI (for himself, Mr. BOREN, Mr. JOHNSTON, Mr. DOLE, Mr. BINGAMAN, Mr. FORD, Mr. SIMPSON, Mr. WALLOP, Mr. BURNS) introduced the following bill; which was read twice and referred to the Committee on Finance

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A BILL

To amend the Internal Revenue Code of 1986 to extend for 2 years the application of credits for qualified nonconventional fuels, to equalize the treatment of tight formation natural gas, and to restore tax credits denied by operation of decisions by the Federal Energy Regulatory Commission.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. SHORT TITLE.

This Act may be cited as the "Nonconventional Fuels Production Incentives Act of 1990".

SEC. 2. EXTENSION OF APPLICATION OF CREDITS FOR QUALIFIED NONCONVENTIONAL FUELS.

Subparagraph (A) of section 29(f)(1) of the Internal Revenue Code of 1986 is amended by striking "January 1, 1991" each place it appears and inserting "January 1, 1993".

SEC. 3. EQUALIZATION OF TREATMENT OF TIGHT FORMATION GAS.

(a) IN GENERAL.—Subparagraph (B) of section 29(c)(2) of the Internal Revenue Code of 1986 is amended to read as follows:

"(B) SPECIAL RULES FOR GAS FROM TIGHT FORMATION.—The term 'gas produced from a tight formation' shall only include gas from a tight formation which—

"(i) is produced from a well drilled after May 12, 1990, or

"(ii) is produced from a well drilled on or before May 12, 1990, but only if, on May 12, 1990, gas produced from such well was gas—

"(I) the price of which was regulated by the United States, and

"(II) for which the maximum lawful price applicable under the National Gas Policy Act of 1978 is at

least 150 percent of the then applicable price under section 103 of such Act."

(b) EFFECTIVE DATE.—The amendment made by this section shall apply to gas produced after May 12, 1990.

○

Mr. BAYLESS. That's correct.

Senator DOMENICI. Is the tight sands one also important in New Mexico?

Mr. BAYLESS. Probably future tight sands will be more important, I would think.

Senator DOMENICI. What do you think, Mr. Bell?

Mr. BELL. It's been very important in the past, and I think it will be true in the future, and the San Juan Basin will benefit from that, not only from the coal side, but tight sands in place today.

Senator DOMENICI. Mr. Bayless, Senator Bingaman asked you if the research that is going on and the so-called oil recovery technology partnership between the Department of Energy and the New Mexico independents and majors, whether you had experienced any benefits from that kind of activity, and your answer was for your business in natural gas, you had not sensed any?

Mr. BAYLESS. That's correct, Senator.

Senator DOMENICI. Are you aware of certain independents and others in New Mexico that have benefited, that do think it's worthwhile?

Mr. BAYLESS. I am not. And if I were, I would try to take advantage of it.

Senator DOMENICI. All right. I do believe there are some and that's why I didn't want to leave the record unattended. And I'm not sure we have a witness, but I think there are three or four who have very exciting research agreements going on right now with the Department of Energy, and we certainly don't want to leave the impression—at least I don't—that nothing is going on, because I believe something significant is.

And yours is principally gas and this focuses principally on oil to this point, as I gather it.

Mr. BAYLESS. That's my impression, Senator.

Senator DOMENICI. I have no further questions.

Senator BINGAMAN. I appreciate the testimony of all the witnesses very much. And we do have another panel, so we'll excuse this panel and go on to our final panel.

Mr. Robert Calisch, director of gas supply and statistics for the American Gas Association; Mr. Robert Cates, who is the director here at the Oil Field Training Center; Mr. Ray Piccini, who is the senior economist with the American Petroleum Institute; and Mr. Michael Chaney, who is vice president of operations of Ziadril, Inc. in Hobbs.

Let me just indicate here that Mr. Robert Calisch is accompanied by Mr. Isaias Ortiz, general manager of coal bed methane operations for Consolidated Natural Gas Company of Pittsburgh. And we appreciate him being here, too, and we will, of course, be glad to hear anything that he would say, as well.

Why don't we start down the list in that order. Start with Mr. Calisch, and we appreciate you coming to testify today and look forward to hearing from you.

STATEMENT OF ROBERT CALISCH, DIRECTOR, GAS SUPPLY AND STATISTICS, AMERICAN GAS ASSOCIATION

Mr. CALISCH. Thank you, Mr. Chairman, and Senator Domenici. I appreciate the opportunity to represent the American Gas Association at this important hearing. The American Gas Association is a national trade association comprised of some 250 natural gas distribution and transmission companies serving over 174 million natural gas consumers throughout the United States.

Today four factors dominate the outlook for the natural gas industry in the United States. First is the steadily rising demand for natural gas, including those emerging markets for electric generation, natural gas vehicles and air-conditioning. Second is the need to increase the use of natural gas to satisfy our natural environmental goals, such as those set forth in Senate Bill 1630 and its recently developed revisions to the Clean Air Act.

Third is the strength of our natural gas supply, particularly domestic natural gas resource base. And fourth, of course, is the restructuring of the natural gas industry to create a new open-access transportation system.

Each of these new developments will enhance natural gas production and provide strength to the national drilling efforts. So I would like to examine each of these factors one by one.

On the demand side, sales of natural gas have been steadily rising since 1987. Natural gas consumption in 1987 increased 6.2 percent over 1986, in the next year it increased 4.5 percent and in 1989 it rose another 5.1 percent.

One especially important category of natural gas demand that is showing strong growth is the generation of electricity. The major motivation for the increased use of gas by electric utilities is that the electric industry generally needs to add more capacity. Yet the industry is reluctant to invest in large expensive new facilities, such as nuclear plants, hydroelectric projects or coal-burning facilities.

Hence, the electric utilities see modular natural gas burning facilities using high efficiency gas turbines as very attractive. Similarly, independent power producers and cogeneration projects also rank natural gas at the top of their fuel choices.

Over the next two decades we at the American Gas Association believe that utility growth alone will increase gas use from 2.7 quadrillion Btu's to 4.5 quadrillion Btu's, possibly as much as 5.4.

The nonutility sector will also grow and grow very significantly. The AGA believes that natural gas powered vehicles show a potential for increased gas consumption. By 2010 as much as 1.2 quads could be consumed by fleet vehicles in the urban areas across the nation.

Gas-fueled air-conditioning equipment plays a big part in the expected growth in commercial gas use in the next two decades, from 2.8 quads in 1988 to possibly as much as 4.7 quads by 2010.

In the environment, our latest study of future natural gas demand includes a special case in which there are stringent federal requirements for reduced emissions of the oxides of nitrogen and sulfur and particulates. Such regulations by 2010 could increase natural gas consumption from 23 quads, which is our base case, to

25.8 quads, which is the environmental case. These levels are in contrast to the 19.5-quad consumption in 1989.

Let me say a few words about our supply. Natural gas resources are abundant in the United States. Total recoverable gas resource includes 796 trillion cubic feet of potential gas, 168 trillion cubic feet of proved reserves, and 24.6 trillion cubic feet of gas on the north slope of Alaska. This total of 989 trillion cubic feet could, at the 17-trillion-cubic-foot-per-year production rate of 1989, represent a 60-year supply of natural gas. The resource base is very strong.

Not so robust has been the drilling activity which is still recovering from the effects of the gas bubble, or the excess production capability, which has characterized the industry since 1979. We believe that the natural gas bubble is no longer a major factor in the marketplace. It appears that 1990 will be the first year since 1979 in which gas supply and demand are in balance.

This fact alone should encourage renewed drilling activities and the producers should be able to sell their production more readily and the intense gas-to-gas competition in the marketplace, which has kept gas prices so depressed, will be lessening.

In 1988, the total gas produced in the United States contributed 5.4 percent more energy to the United States than all of our domestic oil production. More and more there is an increasing emphasis on gas production. Natural gas well completions in 1988 were over 9,000, as compared to 10,000 oil well completions.

But many of the service industry sectors are now reporting that there is a greater emphasis on gas well drilling than oil well drilling in the lower 48. This is a new development and is indicative of the optimism regarding the natural gas resource base.

One additional part of the natural gas resource base which deserves special attention is the so-called nonconventional natural gas tight formations, coal seam methane, devonian shale and geopressured brine. Section 29 tax credits, including those extensions outlined in S. 2288, are an important part of the national initiative to increase the size of the natural gas resource base which is economically producible.

New technology can increase the volume of economically producible gas by improved sensing equipment, improved completion techniques, horizontal drilling, or being able to drill in deeper waters. Similarly, tax credits can allow some resources to be produced even at current wellhead prices despite the difficulty of establishing an economic production level from the wells. AGA strongly supports the expansion of the producing resource, and we believe that the producers and end users alike benefit from such programs.

Finally, the existing million mile transmission and distribution network for the natural gas industry is undergoing major regulatory changes. Open access to nondiscriminatory transportation has changed the industry dramatically. Direct sales from producers to end users has become much more common. Transportation arrangements to ship gas great distances from the wellhead to the burner tip are commonplace. As a result, spot market sales now are the primary determinant of the selling price of natural gas.

In conclusion, the outlook for natural gas energy is strong. Our transportation system is efficient, extensive and flexible. We have every expectation for more increases in gas demand from both ex-

isting and exciting new markets, such as high-efficiency electric generation, gas cooling and natural gas vehicles.

There is a growing confidence among customers and public officials that natural gas is a secure and environmentally benign fuel. Their confidence is justified.

Thank you, Mr. Chairman.

Senator BINGAMAN. Thank you very much. Mr. Ortiz, did you have some comments you'd like to make?

Mr. ORTIZ. I have a few comments.

Senator BINGAMAN. Go right ahead.

STATEMENT OF ISAIAS ORTIZ, GENERAL MANAGER, COAL BED METHANE OPERATIONS, CONSOLIDATED NATURAL GAS CO. ON BEHALF OF THE AMERICAN GAS ASSOCIATION

Mr. ORTIZ. First of all, I appreciate the opportunity to be here. I'm appearing here on behalf of the AGA to talk about a subject that was touched on briefly at the prior session, that is on coal bed methane. I submitted some testimony last week and I'm just going to summarize my comments in the next four minutes.

Coal remains unquestionably the most abundant fossil energy resource in the world today. This resource has added significance. It is becoming understood that coal contains a gas resource, which can also be exploited. Estimates of the total gas in the coals exceed more than 400 TCF. This resource can be developed with existing oil company technology, although improved technology can be expected with increased experience.

Nearly all coals lie at depths of less than 9,000 feet. Between 30 and 50 percent of the gas is contained in the coal below 3,000 feet, which is too deep to be mined and would otherwise remain unexploited. Coals contain anywhere from 100 to 600 standard cubic feet per ton.

Knowledge is rapidly growing concerning the origin, properties and nature of coal beds as reservoirs and source rocks. A considerable amount of reserve and drilling activity is now in progress in several areas of the United States, primarily aided by tax incentives. But the true economic viability is still uncertain.

This large CBM resource potential of 400 TCF rivals conventional domestic gas, undiscovered resources of approximately 195 TCF. At 40 to 50 percent recovery, the coal bed methane resource would mean an addition of 160 to 200 TCF of total U.S. reserves.

Much of the activity to date has been centered in the San Juan and Black Warrior basins, with a limited amount of activity in the Powder River, Raton and Piceance basins. Impediments such as cost, technologic uncertainty, environmental and ownership issues have thwarted activity in other areas.

Gas production from coal is strongly dependent on reservoir conditions. Like conventional reservoirs, coal beds have a wide range of reservoir properties. However, there is not yet sufficient experience to reasonably project well performance and profitability from reservoir conditions.

No methane can be produced until a reservoir is drawn down from its original pressure to a low enough pressure for methane to

dissorb. Generally a large number of wells are drilled and dewatered.

The profitability of CBM is not truly known. Generally these initial production rates are small and in many cases no gas is produced, only water initially. Large capital investments have to be made in order to install facilities for dewatering equipment, salt water disposal and compression.

CNGD has made substantial investment in New Mexico for the development of coal bed methane. By the end of this year we will expect to have spent nearly $20 million in developing large lease. We will have drilled 46 wells at an average cost of over half a million dollars. The average initial production rates are less than a hundred MCF per day and the water production is greater than 100 barrels of water per day.

The economic viability of this project is still uncertain. Additional capital and operating cost requirements are necessary to develop coal bed methane when compared to conventional supplies. The average capital requirements for coal bed methane wells are approximately 50 percent greater than conventional wells and the operating expenses can be as much as ten times more.

Unlike conventional reservoirs, coal bed gas development projects require drilling several wells in a limited area to determine if the operation is economic. This resource requires a multiwell program designed for both water and gas production, which, of course, increases the cost and risk. The tax credit is an important factor in accepting the significant business risk these conditions imply.

Beyond the larger capital investment requirements and the risk associated with this new technology area, there are legal, regulatory and environmental matters which are additional hurdles to developing coal bed methane. Coal bed methane ownership has been a hotly debated issue particularly in the Northeast, where oil and gas estates have been severed from mineable and unmineable coal seams.

Particularly in coal producing areas where coal bed methane has been vented for mine safety purposes, a conflict has arisen as to the development rights held by the oil and gas companies and the coal companies. In the state of Virginia, for example, it required over a year of cooperation between the state, the Virginia Oil and Gas Association and the coal association to produce a comprehensive revision to the oil and gas statute. This statute included coal bed methane regulations and pooling provisions in response to the ownership question. While ownership is not resolved, a framework to begin developing this resource is established, and I think on the map that you have showing the resource potential for the Northeast, there is over 100 BCF of resource.

In addition, during underground mining, methane is emitted from the coal seam being mined and from the methane-charged coal seams and rock strata that lie above and below the mine seam. Of the two main types of underground mines, long-wall mining creates the largest volume of methane emissions. Large volumes of methane are emitted during long-wall mining operations. Much of the methane is emitted from the thin coal seams and rocks fractured in the gob area.

An MSHAW study released in 1987 showed that over 300 million cubic feet a day was being vented into the atmosphere. This was a 1985 number. This amount of vented gas is increasing rapidly due to the increasing use of long-wall mining.

Most methane produced from gob wells is currently vented to the atmosphere. One exception to this is in Alabama, where over 30 million cubic feet a day is captured and sold as natural gas from one mine complex alone.

There is current speculation that this venting may be contributing to the greenhouse effect. Whether or not this proves to be true, it is certainly loss of a significant national energy resource.

Coal bed methane can be utilized by transporting it through a gas pipeline, using it to generate power, or burning it on site to provide thermal energy. Most of the nonmining recovery methods considered will produce pipeline-quality gas.

In summary, coal bed methane represents a large untapped resource potential estimated to be over 300 trillion cubic feet. Tax credits have stimulated development in certain parts of the country. Capital and operating cost requirements are higher for coal bed methane than conventional gas sources. Technologic risks for coal bed methane are greater with CBM than conventional gas supplies.

Substantial methane is being vented in conjunction with long-wall mining, representing a large reserve potential for pipeline sales and power generation. And finally, legal and regulatory impediments have mitigated CBM development to date in many parts of the country.

[The prepared statement of Mr. Ortiz follows:]

SENATE ENERGY AND NATURAL RESOURCES SUBCOMMITTEE

ON MINERAL RESOURCES DEVELOPMENT AND PRODUCTION

OIL AND GAS INDUSTRY INFRASTRUCTURE

APRIL 11, 1990 - ROSWELL, NEW MEXICO

WITNESS: ISAIAS ORTIZ

CNG DEVELOPMENT COMPANY
PITTSBURGH, PENNSYLVANIA

ON BEHALF OF THE AMERICAN GAS ASSOCIATION

INTRODUCTION

Coal remains unquestionably the most abundant fossil energy resource in the world today. Today this resource has added significance. It is becoming understood that coal contains a gas resource which can also be exploited. Estimates of total gas in United States coals exceed more than 400 Tcf. This resource can be developed with existing oil company drilling, stimulation, exploration and production technology, although improved technology can be expected with increased experience. Nearly all coals lie at depths of less than 9000 feet. Between 30-50% of the gas is contained in coal below 3000 feet, which is too deep to mine and would otherwise remain unexploited. Coals contain anywhere from 100 to 600 scf per ton. Knowledge is rapidly growing concerning the origin, properties, and nature of coalbeds as reservoirs and source rocks. A considerable amount of research and drilling activity is now in progress in several areas of the United States, primarily aided by tax incentives, but the true economic viability is still uncertain.

This large CBM resource potential of 400 Tcf rivals conventional domestic gas undiscovered resources of approximately 195 Tcf. At current rates of consumption (18-20 Tcf/year), the conventional undiscovered supply will last less than 25 years. Slide No. 1 illustrates the major coal basin areas of the United States. At 40-50% recovery, the coalbed methane resource could mean an addition of 160-200 Tcf to total U.S. reserves.

Much of the activity to date has been in the San Juan and Black Warrior Basins, with a limited amount of activity in the Powder River, Raton, and Piceance Basins. Impediments such as costs, technologic uncertainty, environmental and ownership issues have thwarted activity in other areas.

This presentation will briefly address CBM technology, production operations of CBM development, and mining-related CBM operations.

COALIFICATION PROCESS

During the transformation of organic plant matter to coal, methane is formed by both biochemical and geochemical processes and, under the proper geologic conditions, the methane is adsorbed under pressure on the internal surface area of the coal. The methane will remain stored in the coal until the pressure is lowered, either by drilling, dewatering and production; or naturally by erosion of the overlying rock strata; or by coal mining. Because the amount of methane stored in the coal is a function of pressure and coal rank, deep, high rank coals normally contain significantly more methane than shallower, low rank coals.

The coalification process is divided into two stages, an early biochemical stage followed by a geochemical stage. Biochemical coalificaton begins with the deposition of the peat (Slide No. 2) and continues through the lignite and sub-bituminous coal ranks. In this first stage, the easily degradable compounds are converted to carbon dioxide, water, and methane by the action of bacteria. The gaseous products formed during this stage are emitted to the atmosphere if the peat is not deeply buried, or move into overlying sediments if the peat is not capped by an impermeable layer, or remain in the peat. As the altered peat undergoes further burial, chemical reactions take place which generate gas and transform coal to higher rank.

Coal has a very large internal surface area, and methane is primarily stored as a monomolecular layer adsorbed onto the internal coal surface. In this manner significant quantities of methane can be stored in relatively small amounts of coal. Even so, the amount of methane and other gasses produced by reaction of coal formation generally exceeds the capacity of the coal to retain the methane, and the excess methane often migrates into the surrounding strata. As the coal rank increases, both the total amount of methane generated and the capacity of the coal to adsorb methane increase. These amounts of gas are usually described in units of cubic ft./ton.

The next slide (No. 3) shows a comparison of the gas storage capacity of coal by adsorption with the capacity of conventional pressure-volume storage in pore spaces. Even highly porous, gas-saturated, conventional reservoirs can hold only a fraction of the gas which can be held by adsorption at the pressures typical of most coalbeds.

Once the pressure on the coal has been lowered and the methane has been released, the methane molecules will begin to move through the coal matrix into the cleat system (Slide No. 4). The time required for the methane to diffuse through coal is dependent primarily upon the coal composition and cleat spacing. This time can vary from less than 1 day to over 300 days. The

molecules move from higher to lower areas of concentration until they intersect an open pathway or fracture in the coal. These fractures are referred to as the butt and face cleats. The nature of the cleat system controls the flow of methane once the methane has diffused through the coal.

NON-MINING RELATED CBM OPERATIONS

Gas production from coal is strongly dependent on reservoir conditions. Like conventional reservoirs, coalbeds have a wide range of reservoir properties including permeabilites, adsorption characteristics, initial pressures, and gas contents. However, there is not yet sufficient experience to reasonably project well performance and profitability from reservoir conditions.

No methane can be produced until the reservoir is drawn down from its original pressure to a low enough pressure for the methane to desorb. This low pressure is referred to as "desorption pressure". Methane production is strongly influenced by the difference between the original reservoir pressure and the desorption pressure for the gas content of the coalbed. Where this difference is high, considerable dewatering and pressure loss are necessary before gas production is possible.

Gas production from coalbeds can improve with time (negative decline curves). A negative decline is illustrated in the next Slide (No. 5) for a CBM well water producer and a conventional gas well. Generally until a large number of wells are drilled and dewatered, the profitability of CBM is not known. Generally these initial production rates are small and, in many cases, no gas is produced only water initially. Large capital investments have to be made in order to install facilities for the dewatering equipment, saltwater disposal and compression.

Also, due to the extremely low pressures required to gain desorbtion, substantial additional capital requirements are necessary for compression and larger pipelines. In order to meet pipeline gas quality specifications additional costs may be required to remove carbon dioxide.

Coalbed methane recovery is not a single type of operation. Recovery operations encompass a wide range of project types, drilling and completion procedures, and production characteristics. Some important factors that affect the configuration of gas recovery include whether or not the coal is being mined; whether the target is solid coal or gob (to be discussed later); whether a single seam or multiple seams will be produced; as well as the coal reservoir characteristics such as gas quality, coal permeability, coal gas content, and whether or not the coal is water-saturated. There, however, are some characteristics commonly associated with coalbed methane recovery efforts. Hydraulic stimulation of the well is generally

required. Coals are subject to formation damage as a consequence of their cleat system. This impacts drilling fluid and cementing programs. Many coals tend to spall, leading to wellbore sloughing and coal debris generation causing higher operating cost.

The next slide (No. 6) illustrates the additional capital and operating cost requirements necessary to develop CBM when compared to conventional gas supplies.

Unlike conventional reservoirs, coalbed gas development projects require drilling several wells in a limited area to determine if the operation is economic. A single well test particularly in water-saturated coalbeds, does not generally provide a good indication of production potential unlike conventional gas resources. In order to get any significant gas production, water must be removed from the formation faster than it can be recharged by the coal aquifer, and the pressure subsequently brought below desorption pressure. This requires a multi-well program designed for both water and gas production, which of course, increases the cost and risk of determining the potential of a new area. The tax credit is an important factor in accepting the significant business risk these conditions imply.

Beyond the larger capital investment requirements and risk associated with this new technology there are legal, regulatory and environmental matters which are additional hurdles to developing coalbed methane.

Coalbed methane ownership has been a hotly debated issue particularly in the Northeast where the oil and gas estates have been severed from minable and unminable coal seams. Depending on the wording of the severance deeds the ownership of the coalbed methane is unclear and development is frustrated.

Particularly in coal producing areas where coalbed methane has been vented for mine safety purposes, a conflict has arisen as to development rights held by the oil and gas operator and the coal operator. In Virginia, for example, it required over a year of cooperation between the State, the Virginia Oil and Gas Association (VOGA), and the Coal Association to produce a comprehensive revision in the oil and gas statute. This statute included CBM regulations and pooling provisions in response to the ownership question. While ownership is not resolved, a framework to begin developing the resource is established.

The regulatory requirements of drilling wells for gas production and vent holes for mining purposes are administered under different agencies. The casing and spacing requirements vary in

different states. Dual permitting requirements are required and in many instances exemptions from oil and gas requirements are necessary. In some cases the state's statutes have to be changed through legislative action which is time consuming, resulting in limited development.

The impact of the environmental regulations governing the disposal of produced fluids is also different depending on whether fluids are associated with mining or oil and gas operations, even though the source is the same.

MINING-RELATED CBM OPERATIONS

Underground mines currently account for 40% of U.S. coal production and 45% of the world's coal production. During underground mining, methane is emitted from the coal seam being mined and from the methane-charged coal seams and rock strata that lie above and below the mined seam. Of the two main types of underground mines, mainly, room and pillar and longwall mining, the use of longwall mining creates the largest volume of methane emissions. This is because longwall mining creates a large fractured zone that releases additional methane from overlying and underlying rock and coal strata.

Longwall mining techniques were originally developed in Europe in the 1800's. Although longwall mining is the most efficient method for mining coal underground with ultimate recovery of the resource averaging 85% (200% greater than room and pillar), longwall mines accounted for only 25% of the U.S. underground coal production in 1987.

The development of a longwall mine begins with the blocking out of sections of coal called panels (Slide No. 7). This development of panels is accomplished using room and pillar mining techniques. Longwall panels are up to 5000 feet in length and vary from 600 to 800 feet in width. The panels are blocked out by driving entry ways down the length of the panel. After a panel has been blocked out, movable cutting tools and a hydraulic roof support system are positioned lengthwise along the short side of the panel. The cutting tool advances along this side of the longwall panel, cutting and removing the coal. As the cutting tool removes the coal and advances, the roof support system is moved forward.

When the hydraulic roof support system is moved, the unsupported roof strata collapses (Slide No. 8). The floor strata also buckles creating a highly fractured zone above and below the mined-out coal seam. The collapsed area, created above and below the mined-out seam, is termed the gob area. The size of the gob area created is a function of the depth of the mined seam, the nature of the rock overlying and underlying the coal seam, and

the dimensions of the longwall panel. However, the gob usually affects an area of at least 50 times the thickness of the coal that has been removed above and 5 times the thickness below the mined-out seam.

Large volumes of methane are emitted during longwall mining operations. Much of the methane is emitted from the thin coal seams and rocks fractured in the gob area.

Methane poses a serious safety threat to coal mining because it is highly explosive in atmospheric concentrations of 5 to 20 percent. The Mine Safety and Health Administration (MSHA) requires close monitoring and control of mine air to ensure that methane concentrations are kept below 1 percent. Because methane is such a serious mining hazard, there has been significant coal mining-related research on methods of methane control. The main technique used for controlling methane emission rates and methane concentration in coal mines is ventilation. However, use of other measures such as horizontal boreholes, gob well and vertical degasification wells drilled in advance of mining are also used.

Ventilation is the one methane control technique that is used universally in underground mines. Federal regulation requires that all coal mines be ventilated by continuously operating mechanical fans which circulate fresh air across the actively mined coal face. This means that several tons of air must be circulated through the mine for every ton of coal mined.

While ventilation will keep methane concentrations at acceptable levels within the mine, large quantities of methane are vented to the atmosphere out of the ventilation shafts (Slide No. 9). A MSHA study released in 1987 showed that 303 MMCF/D was being vented to the atmosphere in 1985. This amount of vented gas is increasing rapidly due to the increased use of the longwall mining process.

To supplement the ventilation system, horizontal boreholes may be used. This technique consists of drilling boreholes from the mine workings into the unmined seam. Once drilled, the boreholes are connected to an in-mine vacuum piping system and are vented to the surface.

Underground longwall mines release methane from the mined coal seam and from several hundred feet of coal and strata in the fractured gob area. In these situations, wells drilled from the surface are used to drain the methane from the gob area operating under a vacuum and are vented at the surface. Production from these wells can be as high as 11 MMCF/D, but will deplete to lower rates and can become contaminated with mine air in a short period of time.

Most methane produced from gob wells is currently vented to the atmosphere. One exception to this is in Alabama, where over 30 MMCF/D is captured and sold as natural gas from one mine complex alone. The quality of this gas is highly dependent on mining practices. In most mining operations this gas is not pipeline quality. The total volumes of gas from this point source is not known but is under study by the EPA.

An additional method for controlling methane emissions is to predrain the methane from the coal before mining operations are begun. This can be accomplished through the use of vertical degasification wells. Vertical wells are similar to conventional gas wells and are drilled into the seams before mining. These wells can have larger casing to accommodate the large volumes of gas produced at very low pressures.

Thus, gas can be kept out of the mine air by ventilation, by predraining the gas through vertical degasification wells, by horizontal boreholes, and by wells drilled to vent the gob area. Different combinations of all of these methods are used at underground coal mines in the U.S. With limited exceptions, the gas which is removed from the mine is vented to the atmosphere. There is current speculation that this venting may be contributing to the greenhouse effect. Whether or not this proves true, it is certainly a loss of a significant national energy resource.

CBM UTILIZATION

Coalbed methane can be utilized by transporting it through a gas pipeline, using it to generate power, or burning it on-site to provide thermal energy. Most of the non-mining recovery methods considered will produce pipeline quality gas. Any method which provides direct access to the coal seam should provide gas with a methane content exceeding 95%, i.e. pipeline quality. There have been a few cases where coalbed gas has had enough diluents in it to lower the heating value below pipeline specifications.

The US Bureau of Mines has analyzed over 400 gas samples of CBM gas from 12 coal seams nationwide. These were taken from 98 boreholes into the seams. Their average gas analysis was as follows:

Methane	97%
Ethane+	<1%
Nitrogen	1%
Carbon Dioxide	1%

Reservoir characteristics of CBM require that a low pressure be maintained at the point of production from the seam. This will

require the subsequent repressuring of the gas in order to deliver it into a pipeline. This compression phase will also include dehydration since the gas is typically water- saturated as it is produced from the coal seam. Local pipeline operating conditions will determine the costs but CBM compression requirements are much higher than conventional gas since the production pressures are at 50 psig or less.

The cases where non-pipeline quality gas is produced may provide fuel for power generation. This could be in the form of a small power plant or a cogeneration facility. In either case, any electric energy not utilized on site could be sold to the supplying electric utility.

Gob gas vent holes should provide a suitable fuel source for power generation. Even though individual wells do not have a long life expectancy, new wells will be drilled as mining advances. A backup gas supply may be desirable in order to offset any possible interruption in mine development. This backup supply might even include vertical CBM wells into virgin coal areas. The backup supply could also help smooth any unexpected fluctuations in gas quality from the gob gas wells.

SUMMARY

1. CBM represents a large untapped resource potential estimated to be 400 Tcf.

2. Tax credits have stimulated development in certain parts of the country.

3. Capital and operating cost requirements are higher for CBM than conventional gas sources.

4. Technologic risks for CBM development are greater with CBM than conventional gas supplies.

5. Substantial methane is being vented in conjunction with longwall mining, representing a large reserve potential for pipeline sales and power generation.

6. Legal and regulatory impediments have mitigated CBM development to date.

CAPITAL COST REQUIREMENTS
CBM VS CONVENTIONAL GAS

	CBM	ADDITIONAL CAPITAL COST REQUIREMENTS (%)
DRILLING	FLUIDS	2
COMPLETION	CEMENT & PIPE	13
	HYDRAULIC STIMULATION	5
PRODUCTION	PUMPING UNIT	13
	FLOWLINES	7
	COMPRESSION	5

		ADDITIONAL OPERATING COST REQUIREMENTS (%)
OPERATIONS	SALTWATER	200
	GAS SCRUBBER	50
	COAL FINES	60
	SALTWATER	200
	COMPRESSION	80

Senator BINGAMAN. Thank you very much for that testimony.

Mr. Cates, we're very pleased to have you here. We appreciate all your hospitality during this hearing.

Mr. CATES. Mr. Chairman, Senator Domenici, we're proud to have you on campus and this hearing.

STATEMENT OF BOB CATES, DIRECTOR, OIL FIELD TRAINING CENTER, EASTERN NEW MEXICO UNIVERSITY

Mr. CATES. Mr. Chairman, working with your staff, the Oil Field Training Center volunteered to solicit specific information from various segments of the petroleum industry, and our thanks to those who returned these completed surveys. This provided reinforcement and background information for this hearing, as well as revealing insight into the state of industry, possible solutions to some of the problems the industry is currently facing.

Some drafted letters listing specific concerns and communicated approval and encouragement to those who organized and promoted these hearings in order that pertinent issues can be discussed and possible alternatives explored.

Questionnaires were mailed out to approximately 1,500 persons in the oil and gas industry, including majors and independents, drilling and well service contractors, individual members of regulatory agencies, persons working for industry service companies, national, state and local public servants, various interested individual citizens. The results were tabulated and comments recorded.

On questions that could be answered by yes or no, percentages were calculated. Comment sections were preserved intact and distributed to senators, their staffs and members of the panels prior to the hearing. Copies of these results are available upon request.

There were four categories of questions. Four were related to the health of the domestic oil and gas industry, six were inquiries relating to the need for a trained work force, one question was a specific needs assessment of suggested skills desirable for future employees, and two questions explored the roles of specialized training schools in meeting the demand for skills desired of entry-level employees.

Answers to questions relating to the domestic oil and gas production were almost unanimous, 99 percent in fact, in recognition of the need to stabilize and develop the domestic industry, with various suggestions as to how this might be accomplished. The need for a healthy, viable domestic industry was defended upon the basis of national security and the risk of allowing foreign control of supply.

Another concern was the outflow of funds to foreign companies and the negative effect on the balance of trade payments. A third problem expressed was the reduction in tax revenues available to the federal government and the states. The fourth concern was the lack of perceived stability, which inhibits capital investment.

Responses to the six questions relating to the necessity of having in place well-trained workers and a pool of trained applicants available from which to select new employees drew a unanimous vote. Most employers had an urgent need to implement policies and programs that would raise the skill level of existing employees.

As job requirements change and become more complex, employees must be provided with the opportunity to acquire these new skills.

Responses indicated that prospective employers felt that greater emphasis in training institutions should be placed upon these subjects, such as safety, communication skills, computer literacy and environmental awareness in order for the graduate to enter the job market in the petroleum industry. The need for a technical work force is growing rapidly and expected to increase dramatically in the near and foreseeable future.

To assist recruitment of graduate technicians, 60 percent of those responding stated they would be willing to enter into a cooperative education work agreement with the institutions that teach petroleum technology, 42 percent were willing to supply financial assistance to students while in school, and 23 percent replied they would even consider some type of endowment program with certain schools in order to have access to graduates from that program.

Two questions sought to define the roles of specialized training schools teaching petroleum technology. While slightly over one-half were not utilizing graduates from petroleum technology schools on a regular basis, a large majority stated that the increased technical skills required of future employees would demand a greater utilization of graduates of programs teaching engineering fundamentals and exposure to proper work ethics and procedures.

While this summary has been very brief, the comments to which I've alluded reveal a great degree of concern for our myopia as a nation to these issues which confront us and could drastically alter our life-style.

Thank you.

[The prepared statement of Mr. Cates follows:]

SENATE ENERGY SUB-COMMITTE HEARING WEDNESDAY APRIL 11, 1990
BOB CATES, DIRECTOR OF THE OILFIELD TRAINING CENTER, ENMU-R
WILL PRESENT BRIEF SURVEY OF QUESTIONNAIRE RESPONSES.

Our thanks to those who returned completed surveys. This provided background information for this hearing as well as revealing insight into the state of the industry and possible solutions to some of the problems the industry is currently facing. Some drafted letters listed specific concerns and communicated approval and encouragement to those who organized and promoted these hearings in order that pertinent issues can be discussed and possible alternatives explored.

1. Questionnaires were mailed-out to approximately 1500 persons in the oil and gas industry including majors and independents;
drilling and well servicing contractors;
individual members of regulatory agencies;
persons working for industry service companies;
national, state, and local public servants;
various interested individual citizens.

2. Results were tabulated and comments recorded. On questions that could be answered by yes or no, percentages were calculated. Comment sections were preserved intact and distributed to Senators, their staffs, and members of the panels prior to the hearing. Copies of the results are available upon request.

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   *Four were related to the health of domestic oil & gas indsutry;

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   *One question was a specific needs assessment of suggested skills desireable for future employees;

   *Two questions explored the roles of specialized training schools in meeting the demand for skills desired of entry-level employees.

4. Answers to questions relating to domestic oil and gas production were almost unanimous, (99%), in recognition of the need to stabilize and develop the domestic industry with various suggestions as to how this might be accomplished. The need for a healthy, viable domestic industry was defended upon the basis of national security and the risk of allowing foreign control of supply. Another concern was the outflow of funds to foreign companies and the negative effect on the balance of trade payments. A third problem expressed was the reduction in tax revenues available to the federal government and states. The fourth concern was the lack of perceived stability which inhibits capital investments.

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While this summary has been very brief, the comments to which I have alluded reveal a great degree of concern for our myopia as a nation to these issues which confront us and could drastically alter our lifestyles.

Senator BINGAMAN. Thank you very much. And let me just say that this questionnaire and survey that was done is very useful and the results, I think, are very revealing as well. And we're going to include those in the file of the hearing.

Mr. Piccini, why don't you go right ahead with your testimony. Thank you for being here.

STATEMENT OF RAYMOND A. PICINNI, SENIOR ECONOMIST, AMERICAN PETROLEUM INSTITUTE

Mr. PICCINI. Thank you, Senator, I appreciate the opportunity to testify here today. I would like to summarize three basic points that are discussed in some detail in my written submission.

First, the nation's ability to meet its oil needs from domestic sources is deteriorating rapidly. Secondly, energy conservation can play a valuable role in the mix of the nation's energy policies, but it is unrealistic to assume that conservation can stabilize energy consumption without reducing economic growth. And, thirdly, public policies can be implemented that will improve both the nation's economic performance and its energy security.

Although my testimony concentrates on petroleum, domestic development of all economic energy sources clearly is desirable.

As has been stated reflecting the fall in oil prices, which began in the early 1980's and accelerated in 1986, domestic production has trended downward while consumption has increased since 1985. As a result, U.S. oil imports rose from 31 percent of consumption in 1985 to 46 percent of consumption in 1989. And during the first two months of this year, as domestic production continued to decline, the import share reached 51 percent.

Recent data indicate that the downtrend in domestic oil production will continue. Not only did U.S. crude oil production fall last year by a record amount, over one-half million barrels per day, as Alaskan, as well as lower-48-state production dropped, but drilling activity, which is an advance indicator of production, also declined markedly.

Furthermore, both private as well as the government analysts expect lower domestic oil production, greater U.S. oil consumption and larger imports over the longer run. Thus, under current policies, the U.S. probably will be continuously importing well over half its oil in a few years and perhaps on the order of two-thirds of its oil by the year 2000. The exact import share will depend heavily on future oil prices, but also on U.S. policy and how it affects domestic production.

The Federal Government can do much to improve the nation's energy position, but its approach should be balanced, both encouraging economically efficient energy conservation and domestic energy production. An effective national energy policy cannot be built on conservation alone. Even if extremely aggressive conservation policies are adopted, sustained economic growth will require additional energy supplies.

There are clear limits as to how much aggregate energy consumption can be reduced unless the nation is willing to have massive government intervention and incur a high cost in forgone economic growth. We should keep in mind that even small reductions

in the rate of economic growth can have a major impact on family income if they persist for a number of years.

For example, the reduction in the U.S. growth rate from a 3.7-percent-per-year average from 1948 to 1973 to 2.6 percent annually after 1973, that is about a 1-percent drop in the yearly economic growth rate, occasioned in part by less intensive use of energy, reduced disposable income in 1988 for a family of three by $7,300.

Now, I'd like to mention a couple of studies that economists at the American Petroleum Institute performed with regard to energy conservation. I think they are interesting and a little bit different from what's been mentioned here today. One fellow looked at this. He said based on past experience, how high would energy prices have to go if the nation is to continue a trendlike growth rate in the economy? That is to say, if the long-term growth rate in the economy is 3 percent or so and that continues, that in itself induces more energy consumption. There are more people, more cars, more appliances, more goods and services and everything.

Based on past experience, he found that to hold energy consumption constant, while that economic growth proceeds, the real price of energy, the inflation-adjusted price, has to rise by three to four times where it is today. In other words, to offset the effect on energy demand from economic growth, you have to get three or four times the energy prices we have today.

And to drop energy consumption by 10 percent or so while you still have that modest economic growth, the price of energy in real terms has to go to five or six times, like over $100 a barrel, in order to get the ten percent reduction in energy consumption. So it's very, very difficult to hold consumption constant.

And I just mention a second study very briefly that we did, is we took the Department of Energy's annual energy outlook for 1989 and we took their most stringent conservation case where the price of oil in real terms is $35 and so on. And then we applied more stringent conservation to that case and saw could we bring down in the year 2000 and have the same consumption of energy as we have in 1988?

Our conclusion was that even if you put in much more stringent assumptions about energy conservation, have new cars going to 39 miles per gallon, have the real price of energy more than double, have increased insulation, increased conservation across the board, you still could not get to a position of constant energy consumption. There would still be, over the 12-year period 1988 to the year 2000, something like 12 percent growth in energy.

So I don't think we can rely upon energy conservation to do the job of reducing the nation's energy import dependence.

Turning briefly to the supply side, increased leasing of federal lands, tax incentives for exploration and production, including incentives for enhanced recovery projects, and the avoidance of regulatory requirements whose benefits are not commensurate with cost would stimulate U.S. oil and natural gas production. These measures would have important economic benefits as well as security benefits, including lower-cost energy, larger U.S. national income, less unemployment, an improved international trade balance and greater federal revenues.

For all these reasons policies to augment domestic petroleum supplies should be an important part of our national energy policy. Thank you.

[The prepared statement of Mr. Piccini follows:]

TESTIMONY SUBMITTED BY

RAYMOND A. PICCINI, SENIOR ECONOMIST
AMERICAN PETROLEUM INSTITUTE

BEFORE THE

COMMITTEE ON ENERGY AND NATURAL RESOURCES
SUBCOMMITTEE ON MINERAL RESOURCES
DEVELOPMENT AND PRODUCTION

UNITED STATES SENATE

APRIL 11, 1990

Summary

o To improve the nation's economic performance and energy security, the federal government should both encourage economically efficient energy conservation and remove unnecessary impediments to domestic petroleum production.

o Some have suggested that an effective national energy policy can be built on conservation alone. Conservation's potential contribution to limiting energy consumption and oil imports, however, may be considerably smaller than sometimes claimed -- unless the nation is willing to pay a very high cost in lost economic growth.

o The exploration/production segment of the domestic petroleum industry has been extraordinarily depressed since oil prices fell sharply in 1986. Domestic crude oil production fell from 9.0 million barrels per day (MMBD) in 1985 to 7.6 MMBD in 1989, an annual decline rate of about 350,000 barrels per day. This decline combined with greater oil consumption to raise U.S. gross oil imports from 4.9 MMBD or 31 percent of consumption in 1985 to 8.0 MMBD or 46 percent of consumption in 1989. Moreover, both private and government agencies expect lower domestic oil production, greater consumption, and larger imports in the future.

o The principal government actions that are needed to develop domestic oil and natural gas and thus slow the growth in energy imports are increased leasing of federal lands, tax incentives for petroleum exploration and development, and the avoidance of regulatory requirements whose benefits are not commensurate with costs. The adoption of these measures would have important economic and energy security benefits.

o The most promising public lands for petroleum exploration and development are onshore in Alaska and offshore California and the Gulf Coast. These lands must be explored if the U.S. is to find and develop new petroleum resources sufficient to significantly slow the decline in domestic reserves and production. Legitimate concern about tanker accidents should not lead to the counterproductive step of further restrictions on offshore drilling, which would only increase tanker traffic. The appropriate solution is improved prevention of oil spills and response to them, to which the petroleum industry is committed.

o In view of the drop in domestic petroleum production in recent years and the projected continued decline, the federal government should provide tax incentives to increase investment in exploration, production and enhanced recovery of existing reserves, such as those contained in the proposed Domestic Energy Security Act of 1989 (H.R. 664, S. 449). The imposition of any specific new taxes on the petroleum industry or on its products would be counterproductive.

o The petroleum industry favors reformulating gasoline to reduce air pollution. A cost-effective solution will be found by allowing industry to determine the best way to meet emissions standards rather than by government mandating specifically how gasoline should be reformulated.

o To minimize the damage from any future supply disruptions in world oil markets, the U.S. should not adopt price and allocation controls. The experience of the 1970s demonstrates that such controls aggravate the problems caused by disruptions.

o The federal government should continue to add to the Strategic Petroleum Reserve (SPR), which is an important tool for responding to future supply disruptions.

Introduction

The American Petroleum Institute (API), a national trade association representing over 200 companies involved in all facets of the petroleum business, appreciates this opportunity to present its views on the domestic oil and natural gas situation and on appropriate public policies.

The API believes that although the federal government has taken some positive steps toward a more rational national energy policy, such as the abolition of the Crude Oil Windfall Profit Tax, the phased decontrol of natural gas wellhead prices, and the development of a large SPR, further changes in public policy are needed. The following discussion outlines trends in U.S. petroleum consumption, production and imports, and then focuses on desirable public policies. While the discussion concentrates on oil and natural gas, which together comprise about two-thirds of the nation's total energy, domestic development of all economic energy sources is desirable.

The Energy Security Problem

Oil is the nation's principal fuel, accounting for about 43 percent of total U.S. energy consumption. The U.S. has become quite dependent upon imported oil, and this dependence is increasing at a fairly rapid rate. In 1989, U.S. gross oil imports

were 8.0 million barrels per day (MMBD) or 46 percent of total U.S. oil consumption, compared with 7.4 MMBD or 43 percent of consumption a year earlier and 4.9 MMBD or 31 percent of consumption in 1985. And in the first two months of this year the import share rose to 51 percent. About half of the rise in imports between 1985 and 1989 was due to greater U.S. consumption and about half to lower domestic production. Domestic crude oil production fell from 9.0 MMBD in 1985 to 7.6 MMBD in 1989, an annual decline rate of about 350,000 barrels per day.

Recent data indicate that the downtrend in domestic oil production will continue. Not only did U.S. crude oil production fall last year by a record amount -- over one-half million barrels per day -- as Alaskan as well as lower-48-state production declined, but drilling activity, which is an advance indicator of production, also declined markedly. Oil well completions fell 23 percent and the footage drilled in the search for oil and natural gas fell 17 percent, with an even more pronounced falloff in exploratory drilling.

Both private and government agencies including the U.S. Department of Energy expect lower domestic oil production, greater U.S. oil consumption, and larger imports in the future. Thus, under current policies the U.S. probably will be continuously importing well over half of its oil in a few years and perhaps on the order of two-thirds of its oil by 2000. The exact import share

will depend heavily on future oil prices, but also on U.S. policy and how it affects domestic production.

This growing U.S. dependence on oil imports increases the risk that the U.S. again will suffer the adverse consequences of an oil supply disruption. Greater U.S. oil import demand reduces the amount of unused oil producing capacity around the world, and therefore it increases the likelihood that a supply cutback by one or more oil exporting nations will cause the world oil price to rise sharply. Greater U.S. oil import dependence also increases the potential adverse effects of a disruption on the U.S. economy. These adverse effects include reduced gross national product, higher inflation, and greater unemployment. Therefore, by holding down the growth in our demand for foreign oil, we can make a supply disruption less likely and also reduce the harmful impact of a disruption should one occur.

Desirable Public Policies

The principal government actions that are needed to develop our domestic oil and natural gas resources and thus slow the growth in oil imports are increased leasing of federal lands, tax incentives for domestic petroleum development, and the avoidance of regulatory requirements whose benefits are not commensurate with costs.

Improved Access to Federal Lands

According to U.S. Department of the Interior estimates, the U.S. has 39 to 82 billion barrels of undiscovered, recoverable oil and natural gas liquids resources, with a mean estimate of 58 billion barrels; and 307 to 507 trillion cubic feet of undiscovered, recoverable natural gas resources, with a mean estimate of 399 trillion cubic feet. The federal government owns or manages onshore and offshore lands containing much of these resources. The Interior Department estimates that, for example, federal offshore areas contain about one-third of the nation's undiscovered, recoverable oil and natural gas resources. If the U.S. is to find and develop new petroleum resources that will reduce our demand for oil imports, federal lands must be explored. The most promising lands are onshore in Alaska and offshore California and the Gulf Coast. Yet, year after year, through the appropriations process, Congress imposes leasing moratoriums on promising offshore areas. In addition to the severe limitations on leasing of federal offshore lands, more than 40 percent (some 300 million acres) of federal onshore lands have been placed off limits to energy exploration.

The Coastal Plain of Alaska's Arctic National Wildlife Refuge (ANWR), is an especially promising area. The U.S. Department of the Interior's (DOI) April 1987 report, Arctic National Wildlife Refuge, Alaska, Coastal Plain Resource Assessment, concludes that

if there is economically recoverable oil in the area, there is a 95 percent chance for more than 0.6 billion barrels and a 5 percent chance for more than 9.2 billion barrels of recoverable oil. The mean estimate is 3.2 billion barrels. It should be emphasized that these are not estimates of the total amount of oil in the area, or the "in-place" oil, but rather are estimates of the economically recoverable oil. The mean in-place estimate is much higher -- 13.8 billion barrels. The DOI also has estimated that the area holds huge quantities of natural gas (the mean in-place estimate is 31.3 trillion cubic feet), but the Department notes that recovery of these resources may not be economic over the 30-year time period it considered. This may be so, but if production of such gas does prove economic in that period, each trillion cubic feet can provide the oil equivalent of 500,000 barrels per day for one year.

Opponents to opening ANWR's Coastal Plain to energy development allege that, in terms of total U.S. oil needs, the area would be likely to yield at most only a few months supply of oil. By this reasoning, no U.S. field has ever been or ever will be worth developing. Opponents of leasing fail to recognize that U.S. oil reserves are the accumulation of thousands of individual fields, that daily U.S. output is the sum of the contributions of those thousands of fields, and that many individual fields have been contributing to the nation's production over many years. The following discussion puts ANWR's oil potential in perspective.

Using the mean estimate of 3.2 billion barrels of recoverable oil, the DOI estimates that the ANWR Coastal Plain would have peak production of 659,000 barrels per day. Such production would put this single area among the top 20 countries in the world in terms of crude oil production.

The Interior Department's 3.2 billion barrel mean estimate of the ANWR Coastal Plain's recoverable oil would make the area the third largest oil find in U.S. history -- exceeded only by the Prudhoe Bay field (discovered in 1968 with an estimated 9.6 billion barrels of recoverable oil), which has produced more than 5 billion barrels of oil, and the East Texas field (discovered in 1930 with an estimated 5.6 billion barrels of recoverable oil), which has produced about 5 billion barrels. If the Department's high estimate of 9.2 billion barrels is realized, this would place ANWR close to Prudhoe Bay in the volume of oil discovered and would increase domestic crude oil reserves by one-third. In 1989, Alaskan production accounted for 25 percent of all the oil produced in the United States. But production from these fields resulted from long periods of exploration and development work, and it has begun to decline. ANWR production could importantly supplement production from other Alaskan fields as that production continues to decline.

Some have expressed the view that the ANWR Coastal Plain should not be leased and, most recently, have cited tanker

accidents as supporting the merits of their concern. Certainly, we should learn all that we can from the regrettable tanker accidents that have occurred. Last year the petroleum industry, for instance, announced a program for improving prevention and response to oil spills as well as for research on oil spill cleanups. The Petroleum Industry Response Organization (PIRO), which the industry intends to fund at a cost of about $400 million over the first five years, is planned to create and oversee five regional response centers, each designed to respond to oil spills of at least 200,000 barrels, which is roughly the size of the Alaska spill last year. By joining forces, the planned centers will be able to battle spills larger than 200,000 barrels if needed.

The industry hopes to engage in a meaningful dialogue with government in further developing a cooperative approach to the oil spill issue. Policy makers would draw the wrong lesson from the recent experience, however, if they decided to prohibit leasing of the ANWR Coastal Plain. The petroleum industry's record in developing and producing oil fields on the Alaskan North Slope indicates that such operations can be and are being conducted in an environmentally sound manner. In addition, by substituting for imported oil, ANWR oil would cut the tanker traffic from foreign ports to U.S. ports. Thus, the development of ANWR oil would provide important benefits without increasing overall environmental risks.

Tax Incentives for Domestic Petroleum Development

The exploration/production segment of the domestic petroleum industry has been extraordinarily depressed since oil prices fell sharply in 1986. U.S. crude oil production on average has fallen by about 350,000 barrels per day each year since 1985. The number of oil and gas wells drilled in 1989 was down by 59 percent from the 1985 level and by 68 percent from 1981. The number of active drilling rigs in 1989 was 56 percent below the 1985 level and 78 percent below 1981, while oil field employment was 30 percent below the 1985 level and 43 percent below the peak 1982 level.

The reductions in both domestic petroleum production and investment in future production combine to indicate a greatly weakened domestic petroleum supply capability. Tax incentives could have a positive effect on investment in exploration and production as well as on enhanced recovery of existing reserves. While tax incentives are unlikely to halt or reverse the trend of import growth, they can delay and reduce the trend.

A program of meaningful tax incentives for all petroleum companies without regard to such factors as company size or degree of integration would provide substantial national benefits. The industry favors a comprehensive approach such as that proposed in the Domestic Energy Security Act of 1989 (H.R.664, S.449). For example, under this legislation companies would be eligible to

receive tax credits for all drilling costs; they could receive a credit for the costs incurred to produce stripper oil, heavy oil, oil from enhanced recovery projects, and "harsh environment" oil such as that produced from offshore areas under at least 400 feet of water; and, the tax credits would be permanent.

Regulatory Requirements With Positive Net Benefits

The government should avoid imposing regulatory requirements where costs exceed the likely benefits, and it should always seek to obtain benefits through the use of the most cost-effective methods. Unnecessarily large pollution control costs reduce the nation's ability to develop its petroleum resources and to produce petroleum products as well as its ability to achieve other objectives, without resulting in compensating environmental benefits.

The petroleum industry now is particularly concerned about the reformulated gasoline mandate contained in the Senate's Clean Air bill. The industry agrees that changes in gasoline will help reduce emissions. We are doing joint research with the automobile industry, testing many different reformulated gasolines to try to establish which vehicle-fuel combination works best. However, the Senate bill's mandate -- because it tells refiners exactly how to reformulate gasoline -- would make this much-needed research

pointless. The Senate bipartisan agreement, by contrast, would allow EPA to use these data in determining the best solution.

Moreover, no one has determined how the fuel specifications in the Senate bill's mandate would affect air quality. Certain of the requirements would actually increase some of the pollutants that cause smog and thus would do little, if anything, to reduce ozone pollution beyond the comprehensive program in the bipartisan agreement.

These requirements would also come at great cost to consumers. For the nine cities that the Senate bill targets, the necessary investment would cost up to $20 billion. Consumers in these cities likely would pay substantially more for gasoline, and the burden would fall hardest on the poor, who tend to drive older, less fuel-efficient cars and can least afford to pay more for gasoline. Furthermore, additional cities may adopt the requirements. Finally, the Senate's bill would phase in new fuel requirements in 1992, thus providing inadequate time for the refinery changes to be made.

To summarize, the petroleum industry favors reformulating gasoline to reduce air pollution. However, the Senate's mandate will not provide the best air quality solution at the lowest cost to consumers. The bipartisan agreement's approach -- which sets performance standards and allows industry scientists working with

recognized air quality authorities to find cost-effective solutions -- is far preferable.

Benefits of Recommended Public Policies

Taken together, all of the positive steps outlined above -- increased access to federal lands, appropriate tax incentives, and the avoidance of unwarranted costly regulations -- would stimulate U.S. petroleum production and prevent unnecessary declines. Production in the U.S. would replace an equivalent amount of oil imports.

The recommended measures would have important economic benefits -- as well as national security benefits -- for the U.S. and for other oil importing nations as well.

First, as stated above, greater U.S. petroleum production will reduce the future demand for oil on world markets and thus help to hold down the world oil price, thereby benefitting American consumers who in the aggregate are large net importers of oil.

Second, the U.S. may increase its national income by expending less of its labor, capital, and materials to produce petroleum domestically -- from lands that have not yet been leased, for example -- than it would use to pay for imported oil.

Third, to the extent that increased domestic petroleum production requires the use of specialized labor and equipment that otherwise would be unemployed, increased U.S. petroleum production will raise employment of labor and capital and thus boost national income.

Fourth, lower U.S. expenditures for oil imports will improve the nation's international trade balance.

Lastly, a larger national income means a higher federal tax base and higher tax revenues. Moreover, leasing of federal lands and production from them raises lease bonus and royalty revenues for the federal government.

The Role of Energy Conservation

Energy conservation is sometimes put forth as the principal mechanism to achieve environmental and energy security goals. Of course, the petroleum industry fully supports the efficient use of energy. However, we are convinced that an effective national energy policy cannot be built on conservation alone. API has conducted three studies on energy demand and economic performance that lead to this conclusion.

The API first examined what U.S. energy consumption might be in the year 2000, if the nation maintains moderate economic growth

(2.4 percent per year) and yet achieves much more conservation than the 1989 U. S. Department of Energy (DOE) Annual Energy Outlook projects. The DOE high price case, which assumes a real oil price of $35 per barrel in 2000, projects an increase in energy use of 9.2 quads between 1988 and 2000. This is the smallest consumption increase of any of the DOE cases. The high conservation case developed by API constrains energy demand further, but still projects an energy consumption increase of 6.0 quads between 1988 and 2000. This occurs despite assuming new cars in 2000 achieve 39 mpg, rather than the 34 mpg in the DOE case, along with assumptions of additional savings in the residential, commercial and industrial sectors. This means the nation will have to look to greater supplies as well as conservation to meet its future energy needs.

Second, API estimated, based on historical experience, what levels energy prices would have to reach to induce the public voluntarily to employ various degrees of conservation. Just to hold aggregate U.S. energy consumption constant at 1987 levels through 2000, while economic growth continues at modest rates, the price of energy in real terms would have to rise to three to four times present levels. To reduce aggregate U.S. energy consumption by 10 percent by the end of the century, while still experiencing modest economic growth, the price of energy would have to rise to five or six times present levels. Such large price increases to reduce energy use, or the equivalent in the form of extensive

government intervention, would seriously impair the nation's economic performance.

The third API study examined the relationship between energy use and economic performance. This study found that if energy use is held constant through government-imposed limits, then normal rates of economic growth can be maintained only if more capital or labor are used or if the pace of technological change quickens. Either of these implies a huge increase in investment, on the order of 50 percent of total national investment, and a reduction in aggregate U.S. consumption on the order of 16 percent. It is simply not realistic to expect this to happen. Of course, in the 1970s and early 1980s, the nation adjusted to sharply higher energy prices by using less energy. But this was a period of tenfold oil price increases and was below par for economic performance. In those years, the reduced use of energy hurt economic growth.

Even small reductions in the rate of economic growth can have a major impact on GNP and family income if they persist for a number of years. For example, the reduction in the U.S. rate of growth from 3.7 percent per year from 1948 through 1973 to 2.6 percent annually after 1973 reduced per capita disposable income in 1988 by approximately $2,000 (in 1982 dollars). For a U.S. family of three, real disposable income in 1988 would have been $6,000 greater than actually was the case, if economic growth had continued at the average pre-1973 rate. Measured in 1988 dollars,

that family's 1988 income would have been about $7,300 greater than it actually was, if the earlier growth rate had been sustained.

Finally, the government certainly should not seek to reduce oil consumption through measures that impose costs on the economy far in excess of any energy security benefits. Several studies of the potential effects of higher federal motor fuel taxes, for example, done by private and public organizations including Data Resources, Inc.; WEFA, Inc. (Wharton Econometric Forecasting Associates); and the U.S. Department of Energy have found that a motor fuels tax increase would have severe adverse effects on the national economy. These macroeconomic losses probably would far outweigh any energy security benefits from increasing federal motor fuels taxes.

Public Policies During an Oil Supply Disruption

The above discussion describes the principal actions that the federal government should take now to improve the nation's energy position. The government also should be prepared to mitigate the damage during a supply disruption in world oil markets. The following section summarizes the API's position on the appropriate policies to be followed during such a disruption.

It is clear from the nation's experience during the 1970s that there is one approach to dealing with oil supply disruptions that

will not work -- the imposition of price and allocation controls. These controls succeeded in creating two troublesome crises from relatively small import losses. If reimposed during a future disruption, they will again make the problem worse.

During any future supply disruptions, consumers will benefit most if the market is relied on as much as possible. Oil prices will rise at the outset, but these early price increases will encourage more conservation, stimulate greater domestic energy production, encourage greater fuel substitution, and help to distribute supplies most efficiently. This will help soften the impact of the disruption. Government price and allocation controls, whether at the federal, state or local level, prevent the necessary adjustments to the loss of oil supplies. Thus, such controls foster inefficiencies, increase consumers' cost and inconvenience, discourage investment in domestic exploration and production, and increase oil imports. They should be avoided, and states should be preempted from establishing price and allocation programs that interfere with national solutions.

The SPR currently contains about 580 million barrels of crude oil, about 72 days' supply of gross imports at the 1989 fourth quarter rate. The federal government should continue to add to the SPR, which is an important tool for responding to future supply disruptions. The use of the SPR must be viewed within the context of a government approach to energy emergencies which places primary

reliance on the market. The SPR drawdown should be initiated only after the President has found that a severe energy supply interruption exists or that a drawdown is required by International Energy Agency obligations, as required under the Energy Policy and Conservation Act. The Reserve should not be used in non-emergency situations.

The impact of an energy supply emergency will depend on variables such as the level of stocks, time of year, weather conditions, level of business activity, estimated length and severity of the interruption, and the effectiveness of any demand reducing and supply increasing measures. The rate of SPR drawdown to ameliorate this impact should be set by the President and should depend on an assessment of the circumstances at that time. SPR oil should be placed in the U.S. distribution chain through competitive sales to U.S. refiners, their purchasing agents and/or traditional domestic suppliers of crude oil.

Finally, government low income assistance programs should be considered separately from energy policy. During a supply disruption, the problems of the economically disadvantaged will be heightened. The petroleum industry recognizes an increased need in such circumstances for stronger economic response programs to assist the poor in meeting their basic energy needs. The industry supports such programs. In considering any such program, however, it is important to remember that this is a social concern which can

best be addressed through social welfare programs -- not energy policy. Attempting to achieve social goals by manipulating energy policy can only threaten our ability to meet both our social objectives and our energy needs. This is the mistake that was made in the 1970s through institution of price and allocation controls with such undesirable results. Energy policy must be developed to allow the nation to produce and use its energy resources efficiently. Public assistance programs should not conflict with general energy policy goals, such as increasing domestic energy production, encouraging conservation and reducing oil imports. The nation can and should both provide a sound energy policy and alleviate the problems of the economically disadvantaged during periods of tight energy supplies.

Senator BINGAMAN. Thank you very much. Our final witness is Mr. Michael Chaney, who is the vice president and the operations manager of Ziadril, Inc. in Hobbs. He is here representing the International Association of Drilling Contractors. We're very pleased to have you today. Go right ahead.

STATEMENT OF MICHAEL CHANEY, VICE PRESIDENT/OPERATIONS MANAGER, ZIADRIL, INC., ON BEHALF OF THE INTERNATIONAL ASSOCIATION OF DRILLING CONTRACTORS

Mr. CHANEY. Thank you. Mr. Chairman, Senator, ladies and gentlemen, I'm here representing the oil and gas service industry as a whole. I think it's obvious that they're in trouble having a drilling contractor represent them. I have the last remarks so I'll keep them short and sour. [General laughter.]

Last month I presented a paper at the IADCSPE drilling conference in Houston, and that was titled Back to the Basics: Planning the Operations for Drilling a Well. And I believe that part of that title could be used today, back to the basics. We need help from our government. We need incentives for the oil and gas industry.

Independent operators get 90 percent of their capital from outside investors and this has been dried up for several years. They have no incentive to invest. We need stable oil prices that can give our service companies a lost word, profits.

Insurance costs are too expensive. Malpractice insurance, doctors' costs, lawyers' costs, new technology, whatever the reason, we have to control it. We can't let it control us. Workmen's comp is not too expensive. It is simply out of control. It is a monster and we need to get that monster in a cage today.

New legislation is a constant worry and cost in trying to adapt to each new and impossible-to-understand law that is passed concerning our industry. We need consistent, fairly-paid-for work so that we can obtain a stable, experienced, trained work force.

Senators, we, the oil and gas service industry, have done our part. We are giving better performance, lower cost, lower accident rates and have given no raises in six-plus years. Now it's time for our government to come through for us.

I agree that this is a complicated issue. So is drilling a 14,000-foot gas well in southeast New Mexico on a footage contract with these restrictions. Thank you.

Senator BINGAMAN. Thank you very much.

Let me ask a few questions of Mr. Calisch. Mr. Calisch, this is just sort of my curiosity. I have just become aware, I guess, recently about the significant drop in the price of gas in the last weeks and months. How is that explainable? Do you have an explanation for that?

Mr. CALISCH. The drop, which has occurred over the last two to three months, is a seasonal drop. Let me sort of talk about the spot market and how it responds. The spot market started to move upward in its gas price in the October-November time period, it peaked in the December period, and there were initial contracts written for January wherein the price was over $2.00. It was well up there and much higher than it had been in the previous year.

Immediately when the warm weather started and demand started to fall off, that price came back down, and that price continued to descend even until today. And the April bids, as I understand it, are at extremely low levels. That is true throughout the country, that the April levels are even lower than they were a year ago in some of the bid areas.

What we expect to happen is to see a stabilization of this low level during the time period when natural gas is competing with residual fuel oil to gain a place in the market. We're going to see a rise start up again next fall as storage is filled up and we start to anticipate a greater demand for gas. And again we will see a peak the following winter and go through much the same cycle again.

The part that is difficult, I think, about this cyclical behavior of the gas price is that the producer must think in terms of his average, how much did he sell at each of these prices, and that's really what determines his economics. It's not that high. How high the gas price goes doesn't really help in the long run. It's what the average was over the year and what his average selling price was.

Senator BINGAMAN. I guess my question was prompted by your statement that the bubble, the so-called bubble, we've been hearing about now for a few years is no longer—I think you said it's no longer a major factor in the price, which would have led me to believe that the price of gas would have consistently been somewhat higher than it has in recent years. And yet it's dropped precipitously and, as you indicate, is lower than it was a year ago. So I guess I'm still having a little difficulty understanding that.

Mr. CALISCH. My remark was to a longer time frame, a sort of average over the year, if you will, in contrast to the month-by-month behavior, which you were describing. Certainly the situation two years ago, three years ago, was that in the markets during the summer months when there was competition with residual fuel oil, you still had gas-to-gas competition for trying to get that boiler load, and that drove the price down even further.

So what we think will happen, now that there is more of a supply/demand balance, is that we will see much less of that pressure so that the average price over the year can benefit somewhat from that reduced gas-to-gas competition.

Senator BINGAMAN. Mr. Piccini, let me ask you. You're the economist here. I'm concerned, I guess, that both the oil industry and gas industry are subject to such unpredictable fluctuations in price that really a lot of the rest of what we're talking about is very, very difficult to control, even if we were to fix it all. I really wonder how much of the problem that would fix considering the fluctuations in price that are occurring.

You indicate here the most important things to do for government are to, I think you said, increase leasing on federal lands, tax incentives for exploration and development, and avoidance of regulatory requirements. I agree those are all very important.

Is there anything we should be trying to do about stabilizing the price or are there more problems than benefits from that in your point of view?

Mr. PICCINI. Let me answer it this way. As you know, I'm here representing the American Petroleum Institute. They are 200 member companies, all the big companies throughout the oil busi-

ness. This question of a stable price came up in the context of a variable tariff, import fee, which often has been proposed, you know, where you set a target price for oil and the fee brings you up to it and phases out if the price of oil goes above that certain amount.

The membership of the API could not get a consensus on that issue. And I suspect it would be very difficult to get a consensus in the industry in favor of any mechanism along the lines of stabilizing price that you suggest. Moreover, as you know, we screamed when there were government controls on prices in the other direction during the 1970's when government deliberately tried to hold the wellhead prices in the United States down.

So I mean it would be very difficult, I think, to get a consensus from the oil industry along the lines you suggest.

Senator BINGAMAN. You're not in a position to give us an economist's point of view as to——

Mr. PICCINI. Well, I would say in my personal opinion, that would not be the way to go.

Senator BINGAMAN. It would not make sense in your view for government to try to step in and stabilize the price of oil or gas?

Mr. PICCINI. No. No, I think you'd be opening up real difficulties.

Senator BINGAMAN. Mr. Calisch, is there a concern in the gas industry about the dramatic fluctuations that occur in the price of gas on the spot market? Is there any suggestion that anything should be done to deal with that situation? Or is that just a cyclical phenomenon that everybody accepts and deals with?

Mr. CALISCH. Sir, I think the vagaries of the marketplace are much to be desired to the vagaries of government regulation. We suffered from government regulation of the wellhead prices for interstate gas, as you well know, for many years. We think that that created shortages and opened the industry to a host of problems.

As a result of trying to do good for the ultimate consumer, they really didn't do good for the ultimate consumer. They created a lot of problems for them. So we feel the marketplace is preferable.

Senator BINGAMAN. Mr. Ortiz, do you have a point of view—and I guess you may have alluded to it in your statement there—about the effect of us allowing this credit, this coal bed methane credit, to expire this year, what you see the impact of that on as far as your company is concerned?

Mr. ORTIZ. From our perspective, if the tax credit is discontinued, exploration would stop, development would stop, in our view. And I agree with Bob Bayless, who says that even up here in the San Juan Basin, where there has been a lot of potential, exploration in new areas of the basin would stop.

Senator BINGAMAN. Mr. Chaney, let me just ask you one final question here. I get the distinct impression that the servicing industry has been very severely impacted by the drop in exploration activity and in oil prices in the last three or four years, and that that's particularly true in the Permian Basin and in this part of the country, that prices for workers in the servicing sectors are substantially better, wages are better in other parts of the country.

I don't know all the factors that led to it, but I would ask you, first, is it your impression that the servicing industry has been

harder hit here in the Southwest, and southeast New Mexico in particular, than it has been in other parts of the country and, second, if so, why?

Mr. CHANEY. Yes, I believe it's depressed throughout the nation, of course, but we seem to have been harder hit here. A lot of our drilling is on footage contracts, I'm speaking specifically of a drilling contractor, and that's a bid situation. And usually, generally the low bid gets the job.

We're coming away from that now to where some of the companies are looking at accident records and performance and things like that, stability, financial stability, which who has that now in the servicing industry?

But yes. But to answer your question, I feel like yes, in the Permian Basin and southeast New Mexico we seem to have been hit harder because of our rigs and pulling units, which means cementing companies also don't work steadily. As Mr. McPeters said yesterday on a panel, we put all our rigs up in December and drill like crazy and turn jobs down, and in February we have one rig running, two rigs running.

So we need consistent, if we can, stable amount of work and paid fairly for that work so that we can get more money to our employees. When you work on a drilling rig, if your rig is running, then you get paid. If the rig goes down and is stacked out, well, you're laid off and get no compensation at all. And it must be a tremendous hardship for the rig hands themselves.

Senator BINGAMAN. Senator Domenici.

Senator DOMENICI. Thank you very much, Jeff. Let me ask one very brief simple question to you, Bob, in terms of the training center here and the survey, which I thank you for. I think it's excellent. You heard some testimony that there was a shortage now, in spite of things not being so good in the industry, in the Four Corners area. Some witnesses said they had manpower shortages.

Is there any way that you here at the institute, the Oil Field Training Center, can be helpful in that? If you already are, might you tell us how that is happening.

Mr. CATES. We'd love to be helpful in that, and in the past we have tried to work in that area to bring in people and work with the labor department where we could train them up to some minimum standards and then put them out in the field.

But yes, there is a shortage. We have a perceived notion, too, that this is temporary. Many people just don't want to go to work or come to school either. So as hearings such as this, our TV station and all broadcast there are jobs, I think this will get better to where we could work with the contractors and we would be more than willing to.

Senator DOMENICI. So part of that may very well be the fact that it is still perceived as being inconsistent and lacking in stability and if you got your choice, you don't go for it?

Mr. CATES. Well, you work two weeks and you'll be back to doing whatever, right. I'm hoping that will iron out this year, though, Senator.

Senator DOMENICI. Over at your training center, do you still train people for what you call roustabouts.

Mr. CATES. Yes, we will train them for anything. But, yes, we cut and thread pipe and we hook up pump jacks and we play and we have a lot of fun.

Senator DOMENICI. When the fellow comes in or the man or woman comes in and wants to be trained to be a roustabout, do they know that they are taking a training course in roustabouting.

Mr. CATES. Maybe they have somewhat more exotic aspirations in titles at least, but that's what it ends up. But after they are there awhile, they get their feet on the ground and figure out that's what involved and yes, they do. And there are jobs.

Senator DOMENICI. The only reason I raised it was we were talking down in Carlsbad about the new consortia that's going to train a lot of young people to be waste management exports. A very handsome young woman was there and she said, "Could I speak?" She said, "Couldn't you think of something else other than to call me a waste management expert?" [Laughter.]

You might all know they did. Their whole degree course is going to be called environmental restoration. So she is going to get a very exciting degree. [General laughter.]

Mr. CATES. We need to follow that example, perhaps.

Senator DOMENICI. Very good. I'm not very sure it matters in the patch.

Mr. Piccini, let me ask you: Is there any major industrialized nation in the world that is as dependent upon imported oil as the United States?

Mr. PICCINI. Oh, Japan would be. Japan imports almost all its oil.

Senator DOMENICI. But of its total energy use in the country?

Mr. PICCINI. Yes, I think so. I think if you looked at Japan in total energy, it would be more important than the United States.

Senator DOMENICI. So they are probably the highest.

Mr. PICCINI. That would be the highest of the major nations. Western Europe would be 65 percent dependent upon imported oil, but I'm not real sure about if that would come out to be a higher proportion in its total energy mix. But Japan would be.

Senator DOMENICI. Do you know if they're doing anything significant based on that fact that you might share with us that we're not doing?

Mr. PICCINI. No. Not that I know of.

Senator DOMENICI. You mean you don't know it or you don't want to share it?

Mr. PUCCINI. No, not that I know of.

Senator DOMENICI. Let me ask you this. You have tried to make the point that an economy like the United States, if you take a certain period—let's take right now—and energy prices have a certain Btu cost, that if you dramatically increase those in a relatively short period of time, you have to suffer in terms of standard of living.

Mr. PUCCINI. Correct.

Senator DOMENICI. You keep using growth. I would choose standard of living. We have proof of that, don't we, in the last two crises.

Mr. PUCCINI. That is correct, yes.

Senator DOMENICI. You documented those, where those enormous spurts that occurred in 1973 and 1979 caused two things, rampant

inflation on the one hand and clearly had a very significant effect on the take-home pay of people doing the same kind of work tomorrow that they're doing today, tomorrow being a year and a half from now, and what they have to divvy up is less.

Do you think the United States should rely upon the situation in the world and the supply of oil in the world if it is our standard of living that's at stake? Do you think you are confident enough that that is a stable situation out there?

Of course, you represent a lot of the companies that are out there. You deal in the marketplace. If the price goes up $10 a barrel for you all in five years, you don't necessarily lose. On the other hand, I'm not suggesting you like it. But you're in a little different boat than the rest of us.

Mr. PICCINI. Well, Senator, I think the basic problem—no one has mentioned this—is that when the price of oil falls, the United States benefits.

Senator DOMENICI. There is no question about that.

Mr. PICCINI. Okay. So it's very difficult, very difficult, to get the public support for the types of policies like tax incentives, like leasing land, whatever it may be, that infringes in some ways upon some people in the country. It's very difficult, during a period of stable or falling energy prices where everyone is happy, to get the public support for the types of policies that we do need.

Because we should not be—we are headed down the road—I don't know when, when we're going to see another eruption. I would be pretty confident that—I don't know if it's this year or next year—but we're going to see, in my view, as the world oil market tightens, we're going to see much higher oil prices. And we may even see a disruption where they shoot up very suddenly. That's not really a long shot at all.

Senator DOMENICI. Right. So you agree that this is something serious.

Mr. PICCINI. Of course.

Senator DOMENICI. Although it appears nice and calm right now.

Mr. PICCINI. That is the situation, yes.

Senator DOMENICI. And do you agree that part of our minimizing that seriousness is to maximize our own sources of energy?

Mr. PICCINI. I would say that's the most important part of it.

Senator DOMENICI. Is it not equally as important to diversify our sources of energy also?

Mr. PICCINI. Diversify both in terms of the types of energy we use—that's why I said it's desirable to get every type of economic energy source developed, coal, oil, whatever. Also important to diversify, I think, in terms of the countries that we buy from and that can supply us, to get development so that we're not as dependent upon that OPEC cartel.

Senator DOMENICI. Let me ask you why do we not as consumers, those traveling the highways and byways of the United States in cars and trucks—my recollection is the transportation part of oil is 28 percent of oil, isn't it, 28 to 30 that goes into moving people around in cars and trucks?

Mr. PICCINI. No, it's more than that.

Senator DOMENICI. More than 28? What is it?

Mr. PICCINI. It would be between 50 and 60 percent.

Senator DOMENICI. So more than 50 percent of the oil we use totally is used just for mobility.

Mr. PICCINI. That's correct, yes.

Senator DOMENICI. Don't we pay less than most countries as we fill our gasoline tanks?

Mr. PICCINI. Yes.

Senator DOMENICI. Why are you so reluctant to answer Senator Bingaman's question about stabilizing the price even if we add to it a varying tariff? Do you think things are going to get that much better that we don't want to go down that much?

Mr. PICCINI. No, I didn't answer in the—the way I answered it, and I think it's the only way I can, is to say that it's been widely discussed amongst the oil companies. And I'm just saying, as a representative here of a trade organization, they do not reach a consensus on this.

Now, when Senator Bingaman asked me, I said personally I still don't think that is the way to go. I think it will introduce more problems. But what is the correct price? Who would set that? Would you get enough incentives at that price? There are all kinds of problems. So I was saying on a personal level I would be opposed to the idea, but that the oil companies do not as a group favor it.

Senator DOMENICI. The only reason I was following the questioning along because I thought you said as an economist, you did not favor it, and I could have understood that. You surely don't want to be at odds with those who pay you. [Laughter.]

But in any event, it didn't seem too logical that we weren't at kind of a point in time—price stabilization is always risky, but it appears to me we're at a point in history where it makes a lot of sense.

Do we expect oil prices to go back down to 11 so we wouldn't want this big bulge between 20 and 11? I don't think so. Do we expect them to go—is it more apt that they'll go to 30 in 15 years? I think so. Why don't we stabilize it so we can get more production at home from that day when it might be at 30?

Mr. PICCINI. Let me answer and make another point to you, if I may. There are many items whose prices fluctuate. This is the typical situation. Items fluctuate in price. Business responds to it. Our system is a free enterprise system.

Senator DOMENICI. I understand.

Mr. PICCINI. It's not a system of government controls. The whole world is going in the other direction, against government controls. And we, by and large, let the marketplace work, let it allocate resources efficiently and so on. And all I'm suggesting is that I think we ought to continue along that line with regard to oil.

Senator DOMENICI. I really have not yet been an advocate of it, but I'd like to get a little more on the record. I've been an advocate of an import fee and, frankly, I would answer your question this way, your last one. If you controlled the foreign oil and its prices and you knew that our ability to bring alternatives on board or even to use technology to convert was dependent upon a price level, you'd have an awful lot of thinking before you'd raise the price to the level to let the alternatives come on board.

And I think that's been done in the past. In fact, I read Sheik Yamani, before he got fired, he told us it won't go over $38 per

barrel, because that's what will bring on all these coal conversions and bring on the shale. And they're not dumb. They are pretty smart. So it is a strange market.

How are we going to get the expensive alternatives on board, first, when the price fluctuates so much? You know, if the price fluctuation makes his life difficult as an oil rig operator, think how much more difficult it makes it for alternative energy producers who want to bring something else on line? They aren't even going to invest their money in it.

The price will go down three bucks by next year and then it will be up eight bucks and they'll be over asking us to subsidize these alternatives. And we try it for a little while and the good old American marketplace wins out. We can't subsidize solar enough to bring it on or geothermal or the others. I just wonder if it wouldn't be a pretty good idea, while the clamor is for gasoline taxes, to talk about some kind of a variable import fee along with it. And you don't have to answer that. [Laughter.]

My last question has to do with the natural gas expert. It's my hunch that the Clean Air Act will have more to do with natural gas policy, if the one the Senate passed becomes law, than anything we've done to this point in history. Do you kind of agree with that?

Mr. CALISCH. Yes. I think the overall national desire for better treatment of the environment is going to be a strong stimulus to the use of natural gas.

Senator DOMENICI. And it should increase the demand, not restrain it, right?

Mr. CALISCH. It should have a very, very great impact on the demand for gas and increase it in natural gas vehicles and a host of other applications.

Senator DOMENICI. And we still won't have to worry too much about crude oil. We'll still be using much more than we could ever produce.

Mr. CALISCH. We will be using plenty of natural gas and we'll be using it from the San Juan Basin, we'll be using it from the Permian Basin, and maybe the Raton Basin will come on.

Senator DOMENICI. Thank you, Mr. Chairman.

Senator BINGAMAN. Let me thank this panel very much for the excellent testimony.

I want to acknowledge the presence of a few people here before we close the hearing. David Manning, who is the international trade counsel with the Province of Alberta is here. Where is David? David was in Santa Fe. We appreciate his presence very much.

We have five of our state legislators here, Representative Dick Knowles, who is right here. Dick, thank you very much for being here.

Representative Bob Light is here from Eddy County. We appreciate your attendance.

Representative Mary Thompson is also here, I was advised. Mary, thank you for being here.

Senator Ray Tice, who represents this area. Ray, thanks for coming.

And Representative Glenn Brisco is also here from up around Tucumcari and Quay County.

We also want to thank General Knowles and recognize him and thank him for the resolution that he introduced, sponsored in the state legislature, calling attention to this hearing and the workshops that were held yesterday. I think that's been helpful and we'll include that in the record.

[The resolution referred to follows:]

The Legislature

of the

State of New Mexico

39TH Legislature, 2ND Session

LAWS 1990

CHAPTER _____

HOUSE JOINT MEMORIAL 10

Introduced by

REPRESENTATIVE RICHARD T. KNOWLES
REPRESENTATIVE RICHARD E. OLSON
REPRESENTATIVE BARBARA A. PEREA CASEY
REPRESENTATIVE JERRY W. SANDEL
REPRESENTATIVE ROBERT S. LIGHT
REPRESENTATIVE FRED LUNA
REPRESENTATIVE PAULINE B. EISENSTADT
REPRESENTATIVE LINN J. TYTLER
REPRESENTATIVE ROBERT P. WALLACH
REPRESENTATIVE GARY D. ROBBINS
REPRESENTATIVE TOOTS GREEN

A JOINT MEMORIAL

CONGRATULATING AND SUPPORTING THE OILFIELD TRAINING CENTER ON THE UPCOMING CONGRESSIONAL ENERGY COMMITTEE HEARING IN ROSWELL.

WHEREAS, oil and gas have provided over seventy-five percent of the nation's energy mix for over twenty-five years and since 1985 have been providing sixty-five percent of that mix; and

WHEREAS, the United States has increased its dependence on imported oil and currently is importing one-half of its daily consumption; and

WHEREAS, depressed economic conditions in the domestic oil and gas industry have caused a massive exodus of industry personnel, reducing the work force from 708,300 in 1982 to 403,200 in 1989; and

WHEREAS, trained personnel are a critical component for the successful extraction of oil and gas; and

WHEREAS, the domestic oil and gas industry must aggressively train and retrain personnel to meet the market demands for the products in an environment where rapid technological changes, compliance and safety procedures have occurred; and

WHEREAS, a subcommittee of the United States Senate Energy and Natural Resources Committee will hold a field hearing at the Oilfield Training Center of Eastern New Mexico University at Roswell; and

WHEREAS, the subcommittee will address the training and retraining needs of the industry as the United States faces a move

toward energy self-sufficiency, greater demand for natural gas and major production declines by some Organization of Petroleum Exporting Countries (OPEC) members;

NOW, THEREFORE, BE IT RESOLVED BY THE LEGISLATURE OF THE STATE OF NEW MEXICO that both United States Senators from New Mexico, the United States Senate Energy and Natural Resources Committee members and the Oilfield Training Center be congratulated for coordinating a hearing that will address training for personnel to provide fuels that are vital to our nation's economy and well-being; and

BE IT FURTHER RESOLVED that copies of this memorial be transmitted to the New Mexico congressional delegation, the chairman of the United States Senate Energy and Natural Resources Committee and the director of the Oilfield Training Center in Roswell.

Senator BINGAMAN. I also want to acknowledge General Knowles' recent chairmanship of the Southwest Energy Council. And, of course, Bob Light is also a distinguished member of that group, and we're very pleased to be so well represented on that organization.

As I indicated earlier, we will include the survey that the Oil Field Training Center did and the summary of the responses in the subcommittee files.

Senator BINGAMAN. We also have testimony by Michael J. DeMarco.

[The information referred to follows:]

NEW MEXICO JUNIOR COLLEGE

Arts and Sciences

April 11, 1990

Hon. Jeff Bingaman
Hart Senate Office Building
2nd Street and Constitution Avenue NE
Washington, DC 20510

Senator Bingaman:

New Mexico Junior College is pleased to appear before the U.S. Subcommittee on Mineral Resources Development and Production to discuss "Energy Needs and the Workforce for the 1990's".

The main goal of the Petroleum Technology Department at NMJC has been to educate people so that they will fill a liaison roll between engineers and field superintendents. We have been successful in fulfilling this goal, especially between 1982-1987. However, since the 1986 "energy crunch", we have witnessed a decline in enrollment in Petroleum Technology courses.

What are the needs for the 1990's? Here in the Permian Basin, especially in Hobbs, we have seen a tremendous upheaval in the energy industry. Major oil companies such as: Arco, Amoco, Mobil, Texaco (+ Getty) and Chevron (+ Gulf) have all left Hobbs in the past two years. With these moves have come the early retirement of many field foreman, field superintendents, and technicians. NMJC is prepared to educate and train people to fill these needs. Even though the large offices are gone, the oil remains to be produced, and well-trained people will be needed to do the job!

What can the Federal Government do to maintain a viable domestic petroleum industry in the 1990's?

1. Stable growth in the industry through reduction of the budget deficits.
2. Restoration of income tax benefits to the independent segment of the industry; i.e. intangible drilling cost write offs and partial depletion allowance credits.
3. A balance between environmental concerns and responsible industry development.

Thank you for the opportunity to appear before this committee.

Very truly yours,

Michael J. DeMarco

Michael J. DeMarco
Coordinator/Instructor
Petroleum Technology Department

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U. S. SENATE SUBCOMMITTEE
ON MINERAL RESOURCES DEVELOPMENT
AND PRODUCTION
FIELD HEARING – APRIL 11, 1990

OPENING STATEMENT
MICHAEL J. DeMARCO
COORDINATOR/INSTRUCTOR
PETROLEUM TECHNOLOGY DEPARTMENT
NEW MEXICO JUNIOR COLLEGE

New Mexico Junior College offers an Associate in Applied Arts Degree in Petroleum Technology. Requirements for the degree are: College Algebra, Trigonometry, two semesters of Chemistry, Physics, Electronics, Microcomputer Applications, Composition and Rhetoric, Human Relations, and Technical Report Writing, as well as 29 hours of Petroleum Technology courses.

I mention the curriculum to emphasize that it is academic and is designed to fill the industry requirements for engineering assistants, field foremen, and superintendents. The curriculum was set up by a distinguished group of production managers, drilling contractors, service company managers, and academic administrators; they had advice from many successful Petroleum Technology programs throughout the United States.

Most of the students in NMJC's Petroleum Technology program are full-time employees, working in the petroleum industry. They are all attempting to upgrade their positions. Therefore, these students must attend classes for 4 years to obtain their degrees. They have been educated by Petroleum Engineers in their Petroleum Technology courses.

NMJC has had an excellent relationship with New Mexico Tech. and NMSU. Presently, we are working as a liaison between the Department of Energy and researchers to find a solution to treating produced waste water. The program will have an office and the use of laboratory facilities in the new Bob Moran Energy Building. We are excited to be a part of this program, what it means to Lea County and NMJC!

In conclusion, the Petroleum Tech. Department at NMJC is a viable part of the education of future technicians, field foremen and superintendents. We plan to continue our dedication to excellence throughout the 1990's.

Thank you for the opportunity to appear before this prestigious committee.

Senator BINGAMAN. If anybody else has testimony that they would like to have submitted and included in this record, please advise us, let us know, and we'll keep the record open until April 25.

We appreciate your attendance very much and appreciate all the work that went into organizing this hearing. And let me just say, finally, that the Oil Field Training Center has asked me to invite all of you to attend a lunch directly across the street from the oil field training facilities right away.

So thank you all very much for coming. The hearing is adjourned.

[Whereupon, at 11:52 a.m. the hearing was adjourned.]

[Subsequent to the hearing the subcommittee received the following:]

66885/6

HEYCO
PETROLEUM PRODUCERS

HARVEY E. YATES COMPANY
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FAX 505/622-4221
ROSWELL, NEW MEXICO 88202-1933

April 26, 1990

Jeff Bingaman
U. S. Senate
Washington, D. C. 20510

90 MAY -1 PM 2:08

RE: Field Hearing
Senate Subcommittee on
Mineral Resources,
Development, and
Production
Roswell, NM
April 11, 1990

Dear Senator Bingaman:

We were pleased to have the hearings in Roswell. A great deal of valuable information was presented to the Subcommittee. After listening to the testimony, there are some additional points which should be made and some other points which should be reemphasized. We are therefore very pleased that you have left the record open until April 25 and are taking this opportunity to offer additional comments.

It is important to note that although the bankruptcies have stopped, the oil industry is not recovering. We may have moved from the survival mode to the existance mode but that is as far as current prices have brought us. While the price of oil field service related items may have gone down, and there is now some upward pressure from service companies, the rest of the world has definitely not followed suit. One of the prime examples mentioned frequently during the hearings is Workman's Compensation insurance. While the wellhead price of oil has plummeted, the retail price of diesel and gasoline has not. The price of gas at the wellhead has gone down over fifty per cent but the price of gas to the consumer has not. So while some oil field specific costs of doing business have decreased, there are still many costs which we cannot control and which have escalated. Another of those things which we cannot control is the foreign policy of the United States and other nations. It should be noted that Harvey Yates Company does not compete with only other independent oil companies, it competes with the nation of Mexico, Argentina, Saudi Arabia and all the others. We often become a pawn in the international relations game and other considerations take precedence over the price of oil.

There are really only two solutions to the oil field dilemma. Either the price of oil and gas must increase, and stabilize within certain parameters, or the costs of doing business must be reduced to the point that we can continue to explore for additional oil and gas within the existing price structure.

Whatever the solution is, it must be dramatic and soon. There can be no question that the dependence of the United States on oil imports is not in the best interests of national security. Imports are around fifty per cent now and our reserves of both oil and gas are falling rapidly. Industry cannot turn around, gear up, and begin replacing reserves over night. The momentum is too advanced. The locomotive will take time to stop and back up.

It will take time because the rigs are not there. They are phantom rigs which have been cannibalized and cannot be put back in service. There is little capitol or manpower to suddenly begin building new rigs. If we had the rigs, the man power, trained or not, is not in place. Many people know the reputation of the oil patch and will not be lured into the industry. It will take time to find people, train them, and then drill the wells. During the turn around, the cost of drilling and producing oil and gas will go up because of the cost involved in training personnel. We cannot, as an industry, be an efficient machine because we have lost some 300 thousand trained people. We must begin the turn around now before we have a crises. That crises could come at any time due to a upset in the middle east or an extremely hot summer or cold winter.

Of the two solutions available the import fee/price stabilization seems to be the least desirable and least possible. We continue to hear that nothing like that could make it through this Congress. While a few in the industry continue to propose this solution, I am not sure that the industry really wants to get involved in price controls or import fees. The agricultural industry opted for this kind of solution and we should learn from their plight. We can live better with the vagaries of a market than with the artificiality of a supported or stabilized price. One of the factors behind the current bust was regulated gas prices which were held artificially high. When the FERC decided to pursue open access, the price of gas was driven into the basement. Gas prices remain in the basement, held there largely by regulatory actions.

The industry needs help lowering the cost of doing business so that we can explore and produce petroleum products within whatever reasonable price structure the market dictates. State governments can keep the cost of doing business within reasonable limits by taking action which would encourage lower Workman's Compensation rates. Judgements, and

thus losses, have gotten entirely out of hand. We cannot expect insurance companies to operate without a reasonable profit so a cap on rates is too simple an answer. Some fundamental changes may be necessary in the way juries award judgements and in the benefits provided by Workman's Compensation. We also need to see that Congress or the federal bureaucracy, does not offer any discouragement to the states.

There is a tremendous amount of unnecessary and pervasive regulation which we need to reverse. In the first place this regulation cannot be objectively justified by any statistics, so it is unnecessary. If it was not unnecessary, we would still need to establish priorities. We recognize the environmental juggernaut is rolling, but the oil and gas industry must be excluded unless it can be shown, by at least a preponderance of the evidence, that significant damage is being done to the environment. We must recognize that the environmental impetus is based upon emotion, not facts, and we must not give in to that emotion. The oil patch cannot afford to be managed and regulated by emotion. The environment has become the preeminent issue because the media has made it an issue. It can only remain an issue as long as we allow it to remain. Testimony presented at the hearing clearly indicated that the oil and gas industry cannot be regulated by emotion. We not only cannot stand additional regulation such as the Clean Air Act but we must revisit existing regulations. By eliminating unnecessary and unjustified regulations costs can be substantially reduced.

Most of the environmental work in the United States is complete and we have reached a point of diminishing returns. It is going to cost tremendous sums of money to effect minuscule changes in the environment. The oil patch and the nation cannot afford for the patch to be caught up in that scenario.

Exploration for new reserves cannot occur without money. Testimony has indicated that Independents are responsible for finding the majority of the reserves in the lower forty-eight and Independents cannot drill wells without investors. Since there is little we can do about the price we receive for our products, tax incentives are necessary to attract investments, and to allow exploration within the parameters established by the market place.

Another way to help the oil and gas industry work within the price structure established by the market, affected as it may be by foreign governments, is to continue the joint research between government and industry. While the participants in the hearing were not familiar with any of these joint efforts, HEYCO has been involved with Sandia Lab's researching methods to extract more oil and gas from tight formations. This type of research will either make the removal of products more economical or will increase the amount of

products produced and therefore allow the industry to drill wells when it might not otherwise do so. Cooperative ventures between the scientific community and the oil and gas industry in New Mexico is one way that government can provide an affirmative impact on the industry. This is particularly true for Independents since we do not have research and development staffs available. Our experience in this area has been very satisfactory and programs should be continued and accelerated.

Provide the various tax incentives that have been proposed, eliminate regulations which cannot be proven to be necessary and encourage the cooperative research between government and industry and we can begin replacing reserves.

Sincerely,

Dan Girand
Contracts Administrator

DG/wbn
bingaman